

Real Options in Action: Vertical Phasing in Commercial Real Estate Development

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Abstract

Real estate development is inherently a risky endeavor. Developers encounter varied risks during the different phases of a development project, from permitting to construction and through lease-up and stabilized operations. Flexibility allows a developer to mitigate some of these risks by capitalizing on potential upsides, and reducing the effects from possible downsides. Flexibility, and phasing specifically, enables a developer to manage risk more effectively by allowing a building to grow as market conditions warrant. This thesis investigates the determinants and implementation of vertical phasing, and suggests areas of applicability for vertically phased development. By “vertical phasing”, we mean when a building is originally constructed to a certain height, but includes the intentional capacity for it to expand vertically in the future. Vertical phasing is an example of a real option “in” real estate development. A real option embodies a right, but not an obligation to pursue a future course of action. Flexibility, or real options, in real estate is important because it can add value to a project.

The significant expansion of tall buildings is a recent phenomenon, though vertical phasing itself is not new. Expanding a one story building to two stories, for example, is a common example of vertical phasing. This thesis examines the decision and development process of major buildings that are constructed with the intentional ability to be expanded vertically in the future without disrupting the occupation and operations of the original building. While the intention is that the vertical expansion will take place at some appropriate time in the future, if such an opportunity never arises, the original building can exist by itself as a complete, fully functioning structure.

Drawing from a study of four buildings in the United States and Canada, this thesis examines the context in which vertical phasing of buildings is employed. It first considers the various drivers that lead to vertical phasing. It then discusses the specific issues and challenges with respect to vertical phasing. This thesis argues that while vertical phasing of buildings is rare and complex, it is a viable method of development that has significant potential in enhancing the value of buildings. Specifically, vertical phasing is relevant to corporate real estate development, in which less quantifiable value drivers of a building are tangible and important. By evaluating the drivers and implementation of vertical phasing, this thesis shows that vertical phasing of buildings may be easier than commonly believed, and may be used effectively in corporate real estate development and possibly other sectors of the real estate industry.

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Chapter 1: Introduction

This thesis is a study of flexibility in the design and construction of high-rise buildings. Specifically, it examines the feasibility of vertically phasing the construction of a building. By “vertically phasing”, we mean when a building is originally constructed to a certain height, say 10 stories, but includes the intentional capacity for it to expand vertically in the future, say 5 stories.

Vertical phasing is an example of a real option “in” real estate development. A real option embodies a right, but not an obligation to pursue a course of action in the future. In a typical development project, developers have three major types of options available to them: wait, switch, and phasing options. A wait option is the option to delay the start of the project construction. A switch option is the option to choose among alternative types of buildings to construct, such as office, industrial, or residential. A phasing option is the breaking of the project into sequential phases rather than building it all at once. Phasing options can be either parallel or sequential. Parallel phasing is when a phase, or phases, can be built at any time independently. Sequential phasing is when a phase can only be built after one has been completed. Vertical phasing, the subject of this paper, is one type of sequential phasing.

Flexibility, or real options, in real estate is important because it can add value to a project. For example, say a developer is choosing to develop a single building, and is evaluating between two different sizes. Each building has a set of financial upside and downside possibilities. If the developer instead builds the smaller building with the capacity to be expanded vertically in the future, it allows the developer to limit downside risk while capitalizing on upside potential. By understanding how flexibility can impact the value of a building, a developer can potentially make more informed investment decisions.

The value of flexibility can be quantified through real options analysis. For example, in “Real Options by Spreadsheet: Parking Garage Case Example”, de Neufville et. al. (2006) valued the flexibility of a parking garage that can be expanded vertically. Their analysis demonstrates that

the flexible design of the multi-level garage reduces the maximum possible loss and increases the maximum possible and expected gain while maintaining the initial investment costs low.

Flexibility provides a developer with a way to manage risks of a development project. Developers encounter varied risks during the different phases of a development project, from permitting to construction and through lease-up and stabilized operations. Vertical phasing allows a developer to manage initial lease-up risk more effectively by allowing a building to grow as market conditions warrant.

The significant expansion of tall buildings is a recent phenomenon, though vertical phasing itself is not new. Expanding a one-story building to two stories is a common case of vertical phasing. This thesis examines the decision and development process of buildings that are constructed with the intentional ability to be expanded vertically at a future point in time without disrupting the occupation and operations of the original building. While the intention is that the vertical expansion will take place at some appropriate time in the future, if such an opportunity never arises, the original building can exist by itself as a complete, fully functioning structure.

Using four case studies, this thesis argues that while vertical phasing of buildings is rare and complex, it is a viable method of development that has significant potential in enhancing the value of a building. Specifically, vertical phasing appears relevant to corporate real estate development, in which less quantifiable value drivers of a building (e.g. the ability to keep all employees in one place) are tangible and important.

While a vertically phased building could consist of adding a second story to a one story ranch style single family home, or two stories to a 10 story downtown office building, we chose to examine only buildings in which the vertical expansion presented significant logistical challenges. As a result, we limited our examination to buildings with an original height of at least 10 stories with vertical expansions that increase the height of the building by at least 50 percent. In addition, we only looked at buildings that intend to maintain full occupancy and operations during construction of the vertical expansion, and in which there was at least a two year gap between completion of the initial phase and the subsequent expansion.

Examples of buildings that fit these criteria are relatively rare. We selected four buildings in North America (three in the United States and one in Canada) for which we were able to collect significant information to make comparisons between the buildings and draw conclusions. These buildings are the Health Care Service Corporation Building (HCSC) in Chicago, Illinois; Court Square Two in Queens, New York; the Tufts University School of Dental Medicine in Boston, Massachusetts; and Bentall Five in Vancouver, British Columbia.

To understand further the applicability of vertical phasing, we examined the determinants and implementation of vertically phasing our case buildings. In determining why vertical phasing was selected as the development approach, we focused on the owner's impetus for developing the building, the market conditions at the time the building was developed and constructed, and the zoning conditions for each building. To investigate how vertical phasing was implemented, we examined the zoning, design, construction, project team and financial considerations for each of the case studies. By evaluating the drivers and implementation of vertical phasing, this thesis shows that vertical phasing of buildings may be easier than commonly believed, and has the possibility of being used effectively in corporate real estate development and possibly other sectors of the real estate industry.

To gather information on our case studies we interviewed the main team members involved in the development of each project. At a minimum we interviewed the key owner representatives. In some instances we were also able to interview the project engineers, architects and developers in an effort to understand the full story behind why the projects were phased and the challenges and issues the project teams faced in implementing vertical phasing. While the interviews were conversational, for every interview we used a series of questions to direct the flow of the conversation. A copy of the full spectrum of questions addressed in our interviews is included in the Appendix.

Based on our interviews and review of internal documents, we developed the following brief descriptions of the case studies. The full, detailed case studies are included in the Appendix.

1.1 Health Care Service Corporation Headquarters

Chicago, Illinois

The Health Care Service Corporation (HCSC) Headquarters is located in downtown Chicago across the street to the North from Millennium Park. This single tenant building was designed to be constructed in two phases. The initial 30 story phase was completed in 1997 as a new headquarters for the company. Upon completion of the vertical expansion, the building will contain 54 stories. Depending on internal growth at HCSC, the building is anticipated to remain primarily a single tenant building.

HCSC began to investigate options for a new headquarters in 1991. At the time, HCSC employed 3,000 people, who were housed at Two Illinois Center, about three blocks from the subject building, in 500,000 square feet of leased space. However, HCSC forecasted its workforce to increase to 7,200 employees by 2015 and knew it was in need of a new location. In considering future space needs, they determined that they wanted the ability both to expand and contract, which is difficult to do in a multi-tenant office building. This need and desire for flexibility is what led to the idea of a building that could be built vertically in phases.

HCSC purchased the 100,000 square foot parcel of land in 1993 at a cost of \$230 per square foot. This same land had originally been listed in 1989 at a cost of \$390 per square foot. The land purchase included a negotiated FAR of 18. Construction of the initial phase occurred from 1995 to 1997. Construction of the vertical completion phase began in 2007, and is slated to be completed in 2010. Goettsch Partners was the architect, and Walsh Construction was the construction manager of both phases. There were three key changes to the project team between the two phases: The John Buck Company was brought in as a fee developer, and a different structural engineer and curtain wall fabricator were used in the “vertical completion” phase.

1.2 Court Square Two

Long Island City, Queens, New York

Court Square Two, owned by Citigroup, is part of the Citigroup Campus located one subway stop from midtown Manhattan in Long Island City, Queens. The Citigroup Campus is comprised of Court Square One and Court Square Two. Court Square One is a 1.5 million square foot facility that is home to approximately 5,500 Citigroup employees. Completed in 2007, Phase I of Court Square Two is 15 stories high, contains 490,000 gross square feet and can accommodate approximately 1,800 employees. The building has the ability to expand both vertically and horizontally to 36 stories and 1.4 million gross square feet. Tishman Speyer was the fee developer on the project, Turner Construction was the construction manager and Kohn Pedersen Fox was the architect.

Upon full completion, Court Square Two will contain 1.4 million gross square feet and house more than 4,500 Citigroup employees, a training center, employee cafeteria and a retail bank branch. Completed in August 2007, Phase I achieved a Gold LEED certification and cost approximately \$175 million to construct (included in the cost was construction of a required subway improvement). The total development cost for both Phases is anticipated to exceed \$500 million (excluding land costs).

The total lot size of Court Square Two is approximately 79,000 square feet. Phase I was designed to function as an efficient independent building should the building not be expanded. Phase II will include both a horizontal and vertical expansion. The horizontal expansion will include expansion of the 15 original floors, creating center core floor plates of 39,700 gross square feet to 66,500 gross square feet. The vertical expansion will increase the building to a height of 36 stories. As of 2008, a timeframe for construction of Phase II had not been set.

1.3 Tufts University School of Dental Medicine **Boston, Massachusetts**

The Tufts University School of Dental Medicine building, located at One Kneeland Street in Boston, Massachusetts, was completed in 1973 as a new facility for the Tufts University School of Dental Medicine. When the building was being planned in the late 1960's, the school identified a need for a 16 story building at the site, but had neither the program to support nor the funds to build the structure to its fully intended and approved height. As a result, the building was permitted and built only to a height of 10 stories. However, the School was interested in constructing the building to its full height at a later time, and therefore constructed the building with the capacity to expand in the future.

The building has a footprint of 21,000 square feet, and the original 10 story building consisted of a total of 178,346 square feet. The five story vertical expansion (only five additional stories are being added, rather than the planned six, due to code changes explained later in this paper) consists of an additional 105,000 square feet, bringing the area of the completed 15 story building to approximately 283,000 square feet. One floor will be shell space to be fitted out at a later time. The expansion is scheduled for completion in November 2009.

Construction costs of the original building are unknown. The vertical expansion has a total project cost of \$66.5 million, which consists of \$53 million in hard costs and \$13.5 million in soft costs. \$47 million of the hard costs are attributable to the vertical expansion, with the remaining \$6 million attributable to upgrading life safety elements located in the original 10 story building. The original building was designed by TAC (The Architect's Collaborative), with LeMessurier serving as structural engineer on the project, and Barr & Barr as the construction manager. The expansion was designed by ARC (Architectural Resources Cambridge), with LeMessurier again serving as structural engineer, and Shawmut as construction manager.

1.4 Bentall Five

Vancouver, British Columbia, Canada

Bentall Five, located in Vancouver, British Columbia, is part of the two million square foot Bentall Center, the largest collection of Class AAA office space in Western Canada. Bentall Five is a multi-tenant building developed and currently owned by Bentall Capital, a large Canadian commercial real estate developer. Bentall Five was designed and developed to be built entirely at once or in two vertical phases. Due to market conditions, Bentall Capital elected to construct the building in two phases. The initial 20 story phase was completed in 2002. Phase II was completed in September 2007 and expanded the building to 33 stories.

Bentall Five was originally conceived in 1993 when Bentall Capital constructed a 618 stall, seven level underground parking structure in an effort to assemble the site that is currently home to Bentall Five. The original plan was to complete the land assembly and develop the parking garage to generate income until the market existed to develop additional office space within the Bentall Center complex.

To mitigate against market risk, Bentall Five was designed to be built in either one or two phases. The building received approval from the City of Vancouver in 2000 and construction began on March 1, 2001. At the start of construction, the plan was to build the entire 33 story tower. However, the design permitted the option to deliver the building in multiple phases. In January 2002, based on analysis of market conditions, Bentall Capital decided to construct only the first 21 floors or approximately 330,000 rentable square feet. Phase I was completed in September 2002 with floor plates of approximately 17,000 rentable square feet.

Construction of Phase II commenced in 2005 with tenants able to occupy Phase II in 2007. Phase II contains 13 floors and approximately 230,000 rentable square feet. The floor plates are slightly larger at 17,700 rentable square feet, due to the absence of lower level elevator shafts. The complete Bentall Five is 34 floors (with no 13th floor) and contains approximately 560,000 square feet.

Chapter 2: Vertically Phased Development

This thesis examines the context in which vertical phasing of buildings is employed, drawing from our study of the four buildings. It begins by discussing the various drivers that lead to vertical phasing: market, zoning, and owner requirements. It then discusses the specific issues and challenges with respect to vertical phasing: zoning, design, construction, project team, and financing. This study shows that vertical phasing of buildings may be easier than commonly believed, and has the possibility of being used effectively in sectors of the real estate industry beyond corporate real estate.

While the benefits of vertical phasing can be quantitatively proven using real options analysis, since developers tend not to use this type of analysis when evaluating projects, the financial benefits of vertical phasing are not commonly understood within the development community. In addition, a significant expansion of a high-rise building entails many logistical challenges that may seem insurmountable or overly complex to those unfamiliar with vertical expansion. This thesis intends to show that while vertical phasing is complicated, its difficulties fall within the range of risks typically undertaken by developers, and that a vertically phased development approach can be useful to many different product types.

To understand the applicability of vertically phased development, one needs to determine the conditions for when and how to implement it. The following is a review of the drivers of utilizing vertical phasing and a discussion of the challenges and issues associated with its implementation. As no two development projects are alike, our intention is not to produce a manual on how to phase vertically, but rather to present a framework outlining why vertical phasing was used, the issues and challenges associated with implementing vertical phasing, and how these challenges were overcome in order to demonstrate that it can be implemented more widely than it is currently.

2.1 Determinants of Vertical Phasing

From our analysis of the four vertically phased buildings, we have determined that there are three drivers in electing to vertically phase a project: market conditions, existing zoning, and owner objectives.

2.1.1 Market Conditions

Market conditions appear to be the key determinant in the decision to phase vertically. In HCSC, Bentall Five and Court Square Two, low absorption and significant market volatility were identified as key reasons why the owners elected to phase vertically. All three owners clearly stated that while zoning allowed for the construction of a larger building, the market conditions were not present to support the maximum allowable FAR during the initial phase of construction. As for Tufts, while market conditions did not direct their reason to construct a vertically phased building, the decision to exercise their vertical option was significantly influenced by market conditions. In addition to absorption and market conditions, land cost and market growth are other elements of market conditions that influenced the decision to phase vertically.

2.1.1.1 Absorption and Vacancy

In three of the four case studies, absorption and the market's ability to absorb more space were key drivers in the decision to phase vertically. Every owner indicated that they elected to phase vertically their project as they felt the market could not absorb the amount of space they were able to build should they build the project in a single phase. In each project, the owners believed that the additional, rather nominal, cost that is associated with phasing a building was less than the carrying costs of building the full building in a single phase and incurring high vacancy.

In Chicago, market conditions directed the decision to phase vertically the HCSC building. At the time HCSC purchased the land for the building in 1993, Chicago, along with much of the rest of the country, was experiencing a severe real estate downturn. The soft market allowed HCSC to purchase land at an extremely low price and apply the savings into the cost premium required to construct the building with the ability to expand vertically. During the development of the HCSC building, vacancy in Chicago continued to rise. The site was zoned with an 18 FAR, which equated to a 1.8 million square foot building. In the mid-1990's HCSC only needed

500,000 square feet; however they had plans to grow to 7,200 employees by 2015. The decision to phase vertically the building in the mid-1990s was directly related to the weak market conditions in Chicago, as the market could not absorb the space that HCSC was not able to occupy initially. Rather than carrying the vacant space until either the market strengthened or HCSC grew, the company elected to phase vertically the building. The decision to execute the option on the vertical completion phase was also due to market conditions. When the vertical completion portion is complete in 2010, HCSC will only occupy 60 to 70 percent of the new space. However, they believe the market is strong enough to absorb the remaining space in the building.

In New York, market conditions were also a significant driver in Citigroup's decision to construct Court Square Two in phases. Long Island City, less than a 10 minute subway ride from midtown Manhattan, is a developing commercial area and commands rents significantly less than Manhattan. In recent years there has and continues to be a significant amount of development in Long Island City; however, the rents and the amount of commercial space remain substantially less than other business districts in New York City. Citigroup only needed 400,000 to 500,000 square feet of space, and the market in Long Island City was not able to absorb an additional one million square feet if Citigroup constructed the podium and tower at the same time. As such, Citigroup elected to utilize a phased development approach. As of June 2008, it is unknown as to when or if Citigroup will execute the option to construct the remaining one million square feet.

Of the four case studies, market conditions played the most significant role in the decision to phase vertically in Vancouver. Bentall Capital viewed the option to phase vertically as a defensive measure against market risk and volatility. Prior to the construction of Phase I, Vancouver had a relatively strong absorption and low vacancy rates. However, due to the events of September 11, 2001, combined with the effects of the burst of the technology bubble, the Vancouver market deteriorated significantly, and vacancy rose and absorption declined. As such, Bentall Capital decided to exercise the option to build Bentall Five in stages. In determining when to exercise the option, Bentall Capital waited until vacancy declined and absorption and rental rates increased. By 2005, the size of the office market had been reduced

due to the significant conversion of office space to residential, and improved economic conditions in Vancouver. Bentall Capital then felt the market conditions were right to introduce more commercial product to the market. Another one of Bentall's concerns was to not deplete demand for their other two million square feet of office space in downtown Vancouver. Bentall was highly sensitive to introduce Bentall Five in a market where it would only attract new tenants and not ones from their other buildings.

2.1.1.2 Land Cost

Land cost is another reason why the owners of the selected case studies elected to phase vertically. In all four cases the owners either acquired the land many years prior to construction, as was the case with Court Square Two and Bentall Five, or had acquired the land cheaply, as was the case with HCSC. The cheap cost of land and extended length of ownership appear to be key market characteristics that facilitated the case buildings to be vertically phased.

2.1.1.3 Market Growth

A third market condition that facilitates vertically phased development is the rate of market growth and the market cycle. In all the three case studies that have exercised their expansion option, there was substantial time between the phases. Should market growth be rapid, vertically phased development does not seem ideal as the weak market conditions that encouraged phasing will not last long, and as such the carrying costs while one is waiting for the market to absorb the vacant space will not be great. As there are additional costs associated with phasing, and specifically constructing a vertical expansion phase, it does not appear beneficial to start future phases immediately after the initial phase. Rather a significant amount of time, possibly greater than two years, needs to occur for it to make sense to include flexibility in the development of a tall commercial building.

2.1.2 Zoning Conditions

In all four of the case studies the buildings were constructed as of right, as zoning allowed for a building that was larger than the market could support. In many markets, zoning of a site can be a limitation to a developer who wants to develop a project that requires a variance from the

zoning code. However, for cases where the zoning allows for buildings that are greater in size than the surrounding market can support, phased development, and when appropriate vertically phased development, appears to be a viable approach. Phased development allows for flexibility for the owner to construct part of the project now, but leaves open the option to capitalize on the maximum allowable zoning based on the market's ability to support in the future a larger project.

2.1.3 Ownership Objectives

Typically in development, the objective of the developer or owner is to construct a building that generates the highest value at the lowest possible risk. However, in three of the four cases studies, the owners had non-financial objectives. Tufts, HCSC and Citigroup were motivated to incorporate flexibility and utilized vertically phased development to address operational issues and achieve internal objectives that are difficult to quantify. In all three case studies, the owners indicated that they elected to phase vertically the development to enable them to satisfy goals and objectives unrelated to creating an increased value of the building.

Tufts indicated that a key driver in exercising the option to expand the existing building vertically was that the educational process is significantly enhanced by having all of their faculty and staff within one building, as it facilitates interaction. Furthermore, Tufts indicated that the in-place infrastructure, such as a sterilization facility which is currently located in the basement of the Dental School, motivated them to develop vertically, rather than at a new location. Should they have not expanded vertically and instead constructed a new facility or located the expanded program activities in a new location, Tufts would have had to create new infrastructure and lose the value of having all of their facilities in one location. The ability to keep all of the users at the same location and capitalize on existing infrastructure was a key objective in Tufts' decision to phase vertically the project.

In the case of Citigroup, their decision to construct Court Square Two was a desire to create a corporate campus. Citigroup, who already owned the land and had over 5,500 employees located in Long Island City, felt it prudent to create the corporate campus in Long Island City rather than locating their expanding business units in another area of New York City or the country. Citigroup felt it essential to capitalize on the infrastructure that was already in place as

a result of the presence of the 48 story Court Square One building. While Citigroup was growing, it knew it could not fully occupy Court Square Two should it be built to its maximum FAR. As such, Citigroup elected to phase vertically Court Square Two to meet the current motivation to construct a corporate campus with their future growth potential.

Similar to Citigroup and Tufts, HCSC indicated that they determined to phase vertically as they wanted a building that could grow as the company grew. HCSC felt there are intangibles associated with having the majority of its employees located within the same building, and felt that it was important to develop its corporate real estate strategy such that its facilities could be flexible enough to grow and contract with the company.

2.2 Implementation of Vertical Phasing

Successfully implementing a vertically phased building presents a number of unique challenges and concerns for the developer, especially in the areas of zoning, design, construction, project team composition, and financial considerations. All of the projects we examined, however, were able to overcome these challenges successfully. In this section, we highlight the most common and significant issues to show that they need not be barriers for a developer interested in vertically phasing.

2.2.1 Zoning and Permitting

One significant uncertainty in planning a vertically phased building is whether current zoning and permitting laws will still be in place at the time a subsequent phase is built. The risk of such an occurrence increases with the duration of time between phases, and probably cannot be eliminated entirely. Myriads of zoning, permitting, building code, and other laws at various governmental levels regulate the entitlement of projects, and it would be very difficult, if not impossible, to be able to lock in all such regulations at their current standard in perpetuity. However, the individuals involved in each of the four projects did secure an adequate guarantee that the future phases could be built to give them sufficient comfort in moving forward.

2.2.1.1 Zoning and Permitting Issues

All of the projects we researched were able to lock in the zoning that applied to the site at the time of original construction to ensure that the vertical expansion could take place at the desired mass and height if and when the decision to move forward was made. All of the buildings were able to lock in zoning through various mechanisms as agreed upon with the local municipality.

HCSC received a letter signed by the commissioner of the Chicago Department of Planning and Development ensuring that they would be able to expand vertically the building at any point in the future. Even with this written guarantee, however, one of the reasons HCSC decided to pursue the expansion when they did is that they feared this right could be rescinded. The area surrounding the building had become primarily residential, while at the time the letter was issued the area was envisioned to become primarily commercial. Due to the change in neighborhood composition, HCSC was concerned that public opposition could override their legal right to expand vertically.

Tufts had submitted plans for a full 15 story building to the Boston Redevelopment Authority (BRA) when the initial plans for the building were submitted. While Tufts still needed to go through a permitting process for the expansion, the fact that the BRA had recorded the building as a 15 story structure made the approval process easier and less costly.

In the case of Court Square Two, when the site was rezoned in 1986, the FAR was increased from 2 to 15; however the increase in FAR was contingent upon the owner of the site also paying for a subway station improvement. Citigroup, by paying for and making improvements to connect the above grade Number 7 subway line with the below grade G subway line located at the intersection of Jackson Avenue and 23rd Street, allowed them to achieve a 15 FAR at the site and guaranteed them development rights in perpetuity.

Bentall Capital was able to receive permitting that allowed for the building to be constructed in one or two phases. While no special accommodations were made to secure this, the developer felt that their reputation helped them to receive full permitting.

2.2.1.2 Code Issues

In addition to zoning issues, possible changes in building codes have to be considered when planning a vertically phased building. Even if a local municipality has guaranteed the right to develop a building, numerous changes in building and other codes from other government entities can take place over time that may make it difficult to proceed as originally planned. Several of the project teams had to deal with actual or possible changes in code that mandated changes in the project plan, but did not prevent it from moving forward.

In the case of the Tufts Dental School Building, seismic codes had changed during the years, preventing the additional six stories to be built on top of the original building unless changes were made. Tufts had the option of strengthening the structural steel on each floor of the existing building in order to build all six floors, or it could make the reinforcements on only the first two floors of the original building and build five stories instead. Tufts chose to proceed with a five story, rather than a six story, expansion. In addition, life safety and ADA regulations had been introduced since the building was originally built in 1973. By exercising their option and expanding the building, Tufts was required to also upgrade elements of the original building so that it met the current code.

Citigroup, when planning the first phase of Court Square Two, knew that the building codes in New York City were changing in 2008. As a result, they chose to build the first phase to the new code, even though they believe the building could have been grandfathered under the old code. Building codes rarely change in New York City and the Citigroup development team is confident that the new codes will be in place should the option to construct Phase II be exercised.

HCSC was forced to adapt to a new Chicago code change after construction commenced on their vertical expansion. In reaction to a couple of fatal crane accidents in New York City during early 2008, Chicago responded by requiring that crane jumps occur only when the initial phase was completely unoccupied. Previously, crane jumps could occur with the building occupied during the permitted times of day. The change in code has made construction logistics more complex because it has significantly narrowed the window during which such crane jumps can take place. This has slowed the project somewhat, though not prevented the construction

progress. HCSC also faced changes in wind codes and advancements in technology at the time it was planning its vertical expansion, which forced them to alter the design of the structural system of the vertical completion phase.

2.2.2 Design

One of the complex challenges in planning a vertically phased building is how to design a building that can function as an independent building but can also accommodate a vertical expansion. Designing a high-rise building that is to be constructed in phases requires many special considerations that would not normally be required for a single phased building. Through our study of the four buildings in question, we discovered four building features that provide the most significant challenges and/or concerns when designing a vertically phased building: the curtain wall, stone selection, elevator, and planning for adequate structural and mechanical systems.

2.2.2.1 Curtain Wall / Façade

A large concern for developers is ensuring that the extension of the building has an appearance identical to that of the original building. Even though glass is relatively easy to replicate, all curtain wall systems are custom to some extent. Tishman Speyer, the developer of Court Square Two, raised this as one of their biggest concerns. They thus selected a reputable glass fabricator who they believe will be in business when Phase II occurs. All of the other projects faced certain challenges with the façade of their buildings when it came time to expand. However, each building was able to resolve the issue successfully.

By the time Bentall Five was expanded, the glass manufacturing plant that provided the glass of the original curtain wall had closed. Bentall had to purchase the codes for the original glass and find another producer. This caused a particularly stressful situation for the developer, as the City of Vancouver would only accept glass that matched the existing glass exactly, and the glass manufacturer would not provide advance samples. In the end, the glass ordered matched the original, and the expansion proceeded as planned. Nevertheless, this illustrates the risk that the façade of a building brings to the process of vertical phasing.

The team of the HCSC building faced a different issue. They were less concerned than some of the other teams about matching their curtain wall, as they believed the field was competitive enough that they could find multiple acceptable sources, especially from China. They went through a bidding process for the second phase, which included a bid from the curtain wall manufacturer of the original phase. The team was able to achieve a less expensive bid from a different manufacturer, with which they chose to move forward. While the curtain wall of the second phase looks identical to that of the first, it functions very differently. To date, the team has had no significant difficulties with the new curtain wall system.

Tufts, on the other hand, decided to construct a different façade than the original reinforced concrete. They chose a glass façade to give the building a lighter and airier appearance. While it may not be possible to do this kind of mixing with all façade types, it nevertheless demonstrates how a façade can be adapted to fit something other than the original plans.

2.2.2.2 Elevators

Another significant consideration is how to provide and plan for elevators that will serve the expanded floors within the original phase of the building. Depending on the building's size, it can be possible to extend the existing elevator shafts up to the new height of the building, as is the case with the Tufts Dental School. With larger buildings, however, it is more likely that new elevator shafts will be needed to serve the upper floors. Each of the other three buildings we studied tackled this issue in different ways.

Since Court Square Two consists of both a horizontal and vertical expansion, the development team chose to locate the additional elevator banks in the horizontal addition, adjacent to the existing elevator bank. When the building is expanded, the existing exterior wall adjoining the elevator bank will be removed, thereby combining the old and new elevators into one larger bank. This strategy avoids the expense of installing elevator shafts before they are needed, and most of the logistical challenges of providing for these future shafts within the building.

In the Bentall Five building, both sets of elevator banks were constructed during the initial phase. This strategy increased the up-front cost of providing for elevators, but made the logistics of elevator installation during Phase II easier. To save some up-front costs, the development team decided to not hang rails within the shafts, a decision they later regretted because of the amount of noise it caused during the installation. The elevator banks meant to serve the higher floors were separated from the others by concrete, and this wall was removed during the expansion to create one large elevator bank at the lobby level.

The HCSC Building treated elevators very differently. The elevators were removed from the core of the building, eliminating the need for shafts. Instead, the elevator cabs move through open atriums in the building. Half of the elevators were installed during the first phase of construction. The atriums for the second set of elevators were left empty, creating 30 story tall atriums that were unused during the initial phase. During the expansion, rails were then placed in these atriums for new elevator cabs to serve the upper floors. As a result, work can be seen on the interior of the building from all floors. This method was pursued primarily as a cost-saving measure to save the expense of installing elevator shafts in advance of their need.

2.2.2.3 Stone

When stone is used on a building, its selection must be done carefully to ensure that matching stone will be available during a building's expansion phase. Generally, stone has to be selected from a quarry that is large and consistent enough to ensure that matching stone will be available indefinitely. HCSC incorporated stone into the façade of both phases of its building. Court Square Two uses stone on the interior of its lobby, which will be expanded during the second phase.

On the other hand, the development team at Bentall Five chose only to use stone on the exterior of the first phase of its building, removing the concern about having an adequate quantity of matching stone available at a later point in time. Tufts did not use stone at all in the interior or exterior portions of its building.

2.2.2.4 Structural and Mechanical Systems

The need to provide for adequate structural and mechanical systems in a vertically expanding building may seem like a significant challenge, but our study of the four buildings revealed that this was actually one of the less complex areas to plan. In terms of structural systems, a building needs to be constructed with an adequate foundation and structural columns to support the weight of the fully completed building. In other words, the first phase of the building is overbuilt with a foundation and columns of sufficient strength to support the weight of the later phase. In each building, the columns were extended through the roof of the first phase by a couple of feet to allow for columns to be connected during the expansion. These columns were encased in concrete or other material to protect them from the elements during the time that only the first phase is constructed.

A building also has to ensure that it provides enough space for mechanicals to serve the entire building, whether in the basement or another floor of the initial building, or in a subsequent phase. Typically, full mechanical systems to serve the fully completed building are not installed during the initial construction as a way to save on up-front costs.

At Tufts, for example, the top two stories of the original building were designated as mechanical space, but since the building was not built to its full 16 stories, Tufts fit out portions of these floors for its use. The sections of these two floors that were fitted out will be reclaimed as mechanical space as the vertical expansion is completed.

2.2.3 Construction

Similar to the design of vertically phased buildings, the construction of these buildings challenges the developer to consider unique issues. However these issues and challenges, while sometimes complex, are not difficult to implement. The issues and challenges associated with the construction of vertically phased buildings depend on the phase of construction. The challenges associated with the initial phase concern planning and forward thinking to include elements that are necessary for a future phase but are physically located in the initial phase. The challenges associated with a future phase concern the fact that the initial phase is occupied and

construction of the future phase(s) cannot hinder the operations and safety of the occupants of the lower floors.

2.2.3.1 Initial Phase

In addition to constructing a stand-alone building that can function should the option of constructing a future phase not be exercised, the construction team of a vertically phased building needs to give special consideration to certain elements of the initial phase in order to facilitate future expansion. From the case research it appears that construction of the roof and handling of the cooling towers are the key challenges associated with construction of a building that includes the option to be vertically expanded.

2.2.3.1.1 Roof Construction

With vertical phasing the roof of the initial phase will become the bottom floor of a future phase. This can be challenging because construction of a roof is very different than construction of a floor, which requires greater structural supports. Given the ambiguity of the lifetime and function of the roof of the initial phase, the construction of this element can be one of the most complex and challenging for developers of vertically phased buildings.

The roof has to function as a roof whether or not the construction of a future phase occurs. The time between the initial and future phase(s) could be short, as in the case of Bentall Five, or could be over 35 years, as in the case of the Tufts Dental School. Furthermore, if a future phase is not constructed, the roof of the initial phase must function as a roof for the lifespan of the building. This uncertainty in the required lifetime of the roof presents a difficult decision for developers of vertically phased buildings.

At HCSC, a roof with a lifespan of 10 years was installed in Phase I. During Phase I they included some additional structural support that could enable the roof to be converted to a floor and support the weight of a construction crane. During construction of the vertical completion phase, the construction team found it more difficult than expected to begin the vertical expansion from the top of the original building. The challenges encountered were great enough that they decided to construct a new floor above the original roof, so that the first floor of the expansion

was raised slightly over what had originally been planned. However, in the Tufts case the roof deck was constructed adequately so that it could support the additional five stories and the construction crane.

2.2.3.1.2 Cooling Towers

The location and handling of the cooling towers also present significant challenges in constructing vertically phased buildings. In both the HCSC and Tufts cases the cooling towers for the initial phase were located on the roof of that phase. In the case of HCSC, when they built the vertical completion phase, the construction team worked around the cooling towers and plans to install new cooling towers on the roof of the vertical completion phase and dismantle the cooling towers used for the initial phase at the end of the vertical expansion.

In the case of the Tufts Dental School, the construction team moved the cooling towers to a neighboring building. While there are no plans to move the cooling towers back to the original building, the roof of Phase II was designed to be strong enough to support cooling towers should they need to be moved back again in the future.

2.2.3.2 Future Phases

General conditions of construction, the environment and logistics associated with a construction site, is the key challenge to constructing future phases of a vertically phased building. Due to the vertically phased nature of the building, the lower levels are occupied during the construction of a future phase and as such its construction has to be designed and implemented so that it does not hinder the operations and safety of the occupants of the initial phase. Among our case studies, only three of the four buildings (Tufts, Bentall Five and HCSC) have completed or recently commenced the construction of a future phase.

Safety and minimizing the disturbance to the occupants of the lower levels is the primary challenge in construction of the vertical expansion phase. In all three cases, the construction team focused on noise reduction, overhead protection and tenant communication in their efforts to ensure the safety of the building occupants and to minimize the disturbance to the occupants of the initial phase.

2.2.3.2.1 Noise Reduction

Noise is a significant disturbance created by construction. While all of the cases are located in dense urban areas where high levels of ambient noise and noise from neighboring construction sites are bound to occur, the construction teams of our case studies made concerted efforts to minimize the noise emanating from the construction of their vertical expansion and the possible disturbance it can cause to the occupants of the building. In Tufts, Bentall Five and HCSC, construction activities that generate extensive noise were conducted during non-business hours.

To ensure that the noise levels were kept to a minimum, Bentall generated a list of noise making activities prior to bidding out the construction work for Phase II. The contractors had to develop their bid and schedule their work according to Bentall's requirements. In addition, Bentall installed noise sensors on the work site that would indicate to workers when they were generating noise that was above the acceptable level. Bentall had the right to stop work should noise levels exceed the allowable thresholds. While Bentall did not have to exact their authority, they believed that their detailed noise reduction plan enabled them to have a better relationship with the tenants of Phase I and also contributed to the fact that they did not have to give concessions to any tenants of Phase I as a result of the construction of Phase II.

HCSC and Tufts are currently also conducting activities that generate excessive noise after hours. However, it should be noted that the noisiest components of construction are pile driving and demolition. Neither of these activities is involved in the construction of vertical expansions. The activities involved in vertically phased construction do not create extreme levels of noise in comparison to other construction activities. Bentall Five, HCSC and Tufts all reported that connecting Phase II to the roof of Phase I was the noisiest part of construction. The three cases also had concerns with the sound generated by pumping concrete. Bentall Capital decided to mitigate this noise by bucketing the concrete, while HCSC pumped the concrete through the core of the building as they felt the core buffered the sound adequately.

2.2.3.2.2 Safety and Overhead Protection

Overhead protection and preventing materials and construction debris from falling from the construction site is another area of concern in vertically phased construction. While safety and overhead protection are concerns in all construction, greater attention needs to be paid to safety in the development of vertically phased projects. Specifically in vertically phased developments, execution of safety plans and structures need to be developed so that they protect the occupants of the lower levels without disrupting their operations.

At Tufts, Bentall Five, and HCSC, elaborate overhead protection systems were developed to protect the safety of the occupants of the building. The three projects had similar overhead protection plans and had a zero tolerance policy for debris falling from the construction site. Generally the overhead protection plan consisted of two elements: the pedestrian safety canopy and a safety apron located at the base of the vertical expansion phase.

The pedestrian safety canopy is an elaborate scaffolding system that appears more like an awning than construction scaffolding. Both Bentall and HCSC invested above what is standard in the pedestrian walkway canopy to minimize the appearance of being at a construction site.

Both HCSC and Bentall installed a steel and wood safety apron that extended around the perimeter of the building at the base of Phase II. In addition to the safety apron, Bentall had a mesh netting to catch falling debris that extended some 25 feet from the building and moved up the building as construction progressed. HCSC took an extra precaution of installing safety netting around each of the upper floors under construction to further prevent debris from falling off of the construction site.

An additional safety measure that is unique to vertical phasing is timing of crane jumps. As the crane is often located on top of an occupied building there are specific safety considerations that have to be addressed as to when the contractor can jump the crane. HCSC is facing considerable constraints that have slowed down their construction schedule as they are only allowed to jump the crane when the building is empty. This requirement has reduced the window of opportunity for jumping the crane, as they do not want to disrupt the working day and cannot work on the

building past 9:00 p.m. This requirement was enacted after several prominent crane accidents occurred in New York City in 2008.

2.2.3.2.3 Tenant Communication

In non-phased projects, there are no occupants of the building and communication with tenants is not required. However, with phased construction it is highly important to have constant and honest communication with the occupants of the building, and to communicate both successes and potential disturbances. All of the cases had or have extensive communication with the tenants before and during the construction of the future phase. At Tufts, HCSC and Bentall Five, the tenants and occupants were notified in advance and during construction of all critical events that could potentially impact their operations. Bentall believed that by keeping the tenants properly informed of what was taking place on the site, they were able to minimize any negative impacts that the lower level tenants could have experienced. In addition to communication during construction, Bentall included detailed riders in the Phase I tenant leases that outlined how Phase II could occur. HCSC also began communicating to their employees over a year before construction of the vertical completion phase occurred. All occupants of the building were invited to open meetings concerning the construction of the vertical completion. HCSC felt that communication of what was going on and reminding the occupants that construction was occurring according to plan and that disturbances were being mitigated was highly important.

2.2.3.2.4 Logistics

In the three case studies that have exercised their option to expand vertically, attention was given to developing logistics for the movement of labor and materials up to the construction site and the location of staging area. With the construction site at least 10 stories above grade level, the buildings we studied developed complex plans concerning movement of labor and materials up to the construction site.

In all three cases, the issue of determining how labor would access the construction site and their access to the occupied lower levels was identified as a significant challenge in developing the construction plan for each project. In HCSC, Bentall Five and Tufts, freight elevators were used to move the majority of labor and materials up to the base of the vertical expansion. Both

Bentall and HCSC designated separate entrances for laborers and did not allow laborers into the lobby in order to maintain normal building operations. Tufts allowed laborers to use parts of the occupied building; however, the general contractor was required to train their staff on proper etiquette for behaving in an occupied building to prevent any possible problems.

In terms of materials, the cases used a combination of internal and external vertical circulation to transfer the materials to the construction site. In Chicago, HCSC installed two pipes to deliver concrete and fire protection materials to the top of the building. In Vancouver, Bentall elected to bucket the concrete up to the work site in an effort to minimize noise within the building.

In all three projects, Tufts, HCSC and Bentall Five, an additional staging area was located at grade level. All these staging areas were public plazas designed for use by the building tenants. During the construction, the plaza was roped off and dedicated for use by the construction team. All of the case studies reported that the additional staging area was critical to their ability to implement construction of the future phase. In Chicago, in addition to the staging area at grade, the 29th floor, which was part of the initial phase, was converted to a site office and included a cafeteria for the construction workers. HCSC felt it was vital to locate the site office as close to the construction site as possible to minimize movement of the workers within the building; they felt it would be inefficient if workers had to leave the site area and travel to the ground level to eat lunch.

2.2.4 Project Team

Project team formation may seem to present significant challenges and issues with regards to vertical phasing. Included in these challenges is the ability to maintain team continuity between the two phases and the effect on design, constructability and liability should team members change between phases. However, we found that while these challenges exist, vertical phasing does not cause significant difficulties in this area as compared to non-phased or horizontally phased projects. From our research, the key issues and challenges related to project team formation stem from the team composition and continuity of the project team between phases.

2.2.4.1 Project Team Composition

While vertical phasing appears to involve additional risks, reputable and experienced professionals are vertically phasing their developments. The composition of the project teams in all four case studies included a strong and respected owner who had significant reasons to phase vertically their projects and prominent and seasoned design and construction professionals.

Each owner is a prominent member of their community, which was a significant factor in enabling a successful undertaking of vertical phasing. Tufts Dental School, as an oral health provider, commands much respect within Boston and particularly within the Chinatown community. Tufts attributes this as a significant reason why they were able to gain support and approval for vertically phasing the dental building.

In both Court Square Two and HCSC, the owner is a prominent employer in the city with a long-term presence. Both HCSC and Citigroup believe that their prominence within the community enabled them to gain civic support for their project rather easily.

Bentall Capital has a strong and respected position within the Vancouver community. As such the city and local community are highly supportive of Bentall's developments, which Bentall believes enabled them to successfully implement the vertically phased development process.

It is interesting to note that for both the HCSC and Court Square Two cases, during the evolution of each project there was discussion of a joint venture between the owner and a local and respected developer. However, in both cases the joint venture did not come to fruition. Rather the developer was a fee developer on the project and was not involved in the financing of the project. Both Citigroup and HCSC are sophisticated owners who have reputable corporate real estate departments with proven track records in developing large buildings.

2.2.4.2 Project Team Continuity

Continuity of the project team between phases and the potential negative effects of changing the team composition from one phase to another has been identified as a major challenge with respect to vertical phasing. However, there can be advantages in changing the project team. In

each of the cases that have or are currently undertaking the second phase of the project, key members of the project team were changed. In certain cases the changes in project team were the result of the significant amount of time between the two phases, while in other cases certain team members were changed based on qualifications. In all instances the three projects reported success and even significant benefits from changes in their project team.

Due to the 35 years between the original construction of the Tufts Dental School and the expansion, few of the team members involved in the design and construction of the original building were able to participate in the expansion. However, the mechanical engineering firm that worked on the building was still in business, which did help in the expansion process. While Tufts had to conduct extensive tests to re-document structural components of the original building, they did not report any issues with insurance as a result of the difference in project team composition between the two phases.

With respect to the HCSC building, most of the development team from the original building, including the architect, general contractor, and MEP engineer, are involved in the building's expansion. However, one of the critical team members, the structural engineer, was changed. This change was viewed to be advantageous, because the new structural engineer was able to take an independent look at the original structural work, which both increased confidence in the expansion process, and brought some new approaches to save structural materials in the construction of the expansion.

Bentall Capital enlisted a similar team for Bentall Five as it had used for the rest of the Bentall Center. Interestingly, Bentall Capital used different construction managers for Phases I and II. In addition, the internal project team from Bentall Capital was different between phases. Bentall Capital reported that the change in project team make-up between phases did not hinder the project in any manner, and that no additional insurance was taken out as a direct result of the change in project team.

While Citigroup has not exercised its option to construct the future phase of Court Square Two, attention has been given to issues of project team continuity between the initial and future

phases. Preemptively to minimize cost escalation, the fee developer of Court Square Two bought options from key trades for construction of Phase II. However, as time has passed, and there is no indication as to when or if Citigroup will proceed with Phase II, many of the options have expired and rebids for all of the trades will need to occur.

Similar to the other cases, there is significant concern among the Court Square Two project team in using the same curtain wall fabricator in both phases to maintain uniformity in curtain wall design. However, as is evident in the other cases, changes in the curtain wall subcontractor does not have to derail the construction of future phases. Both HCSC and Bentall experienced changes in their curtain wall subcontractors between their initial and future phases. While it might not be ideal to change elements of the curtain wall team or other key subcontractors or consultants, as indicated by the experience of the other case studies, changes in the project team composition can be beneficial.

2.2.5 Financial Considerations

Typically, real estate developments are financed through a combination of debt and equity. However, the cases we investigated did not use traditional sources of capital. Only one of the projects we studied, Tufts, used debt in the form of bond financing. Otherwise, the projects were financed entirely through internal sources of cash. Furthermore, no one used real option analysis to value the project.

In the cases where cost information was available to us, the cost premium to create the option for the building to be vertically phased ranged from 7.5 percent to 13 percent of the initial phase's total development cost. The cost drivers of the option resulted from the additional steel and other building materials that needed to be included in the initial phase in order to enable the construction of the future phases. Soft costs were also higher primarily due to extra resources required from design and engineering team members.

Other cost drivers associated with construction of future phases include the mobilization costs associated with elevating labor and materials, the overtime utilized to conduct noise-making activities during off-peak hours, the elaborate overhead protection system, a slower construction

schedule, and the need to replace certain mechanical systems such as cooling towers and construct a new roof.

HCSC estimated the premium to incorporate vertical expansion to be 10 percent to 13 percent of the development cost of the original building. Citigroup estimated that the premium to phase to be 7.5 percent. This figure is low because Court Square Two, as both a vertically and horizontally phased building, initially constructed only one-third of the structural support needed for construction of Phase II. If this infrastructure had to have been installed in Phase I, the premium would have been much greater. Bentall Capital reported that the cost of the option was rather nominal, possibly in the \$5 million CAD range.

Chapter 3: Application of Vertically Phased Development

While specific conditions warrant vertical phasing and unique issues are associated with implementing vertical phasing, we believe there are significant advantages to vertical phasing, especially when part of a corporate real estate strategy. Through our analysis we have identified several advantages to vertical phasing, how it can specifically benefit corporate real estate and considerations with respect to non-owner occupied buildings and other product types such as residential and hotel.

3.1 Advantages of Vertical Phasing

While flexibility increases the value of a building and reduces risk, as demonstrated by de Neufville et. al. (2006), many developers do not perceive it as so. Partially, this may be because traditional measures of valuation, whether static measures such as cash on cash return, equity multiples, or dynamic measures such as discounted cash flow analysis, cannot demonstrate the value of flexibility. Left without the ability to quantify the value of flexibility, developers are more likely to focus on all of the risks, outlined earlier, associated with vertically phasing a building, which can seem daunting.

Real estate development is of course an inherently risky venture, and successful developers have learned to manage these sources of risk. Vertical phasing introduces a set of new and somewhat unfamiliar risks that may well make traditional real estate developers nervous. However, vertical phasing can also allow a developer to effectively manage certain risks associated with real estate development. From our case review we have found that vertical phasing can mitigate certain aspects of market, permitting and subsurface risk.

3.1.1 Market Risk

Market risk is a significant risk inherent in the development process. Vertical phasing can potentially enable a developer to manage initial lease-up risk more effectively by allowing a building to grow as market conditions warrant. Should demand not exist for construction of a building that maximizes the allowable FAR, vertical phasing allows a developer to capitalize on the allowable zoning at a future point in time. With the flexibility of vertical phasing, when the

market conditions change, a developer can quickly and more effectively capture market demand without further permitting and subsurface risk.

Market conditions, and specifically lack of demand, were a central driver in the development of Bentall Five. The building was designed with vertical phasing in mind, though the developer initially planned to develop both phases at the same time. However, the events of September 11, 2001 had a significant negative effect on demand for office space in Vancouver, as it did in many other parts of the world, leading the developer to elect to postpone construction of the second phase to a later date. As a result of the flexibility included in the design and development of the building, Bentall Capital was able to construct a smaller building that met the market demand while preserving their ability to construct the building at its full height at the appropriate time.

In the case of Court Square Two, Citigroup elected to phase vertically as they did not have the internal need for a building of a 15 FAR, and the market was unable to absorb the excess space. However, anticipating future growth needs, Citigroup wanted to have the ability to have a building of that size at some point in the future. Originally, they anticipated construction of Phase II to begin within a couple of years of Phase I. However, recent market conditions led them to revise this plan, and there is currently no anticipated date for commencement of Phase II. By having the flexibility to not build the building to its full capacity at once, Citigroup has been able to reduce the amount of capital invested in Court Square Two while preserving the option of expanding its capacity when either internal demand or market demand can support the additional space.

Similarly, HCSC wanted to use all of its existing FAR on the site, but did not need all of the space when the first phase was constructed in 1996. The owner from which they bought the property, which was a part of a PUD, had the ability to transfer FAR among the parcels it was selling. HCSC negotiated an FAR of 18, which allowed them to build the largest building possible without triggering the requirement to contribute financially to a planned \$42 million park adjacent to the site. The first phase, consisting of 33 stories and 1.4 million square feet, was enough to accommodate HCSC's space needs at the time. The decision to expand in 2006 came partially because the company would now be able to occupy most of the space that would

become available in the 24 story, 883,000 square foot expansion, and thereby capitalize on the maximum FAR.

3.1.2 Permitting Risk

The permitting process can be one of the most difficult and riskiest stages in the development cycle. In each of the four case studies, the projects were approved at their maximum possible height before proceeding with the first phase of construction. Therefore, these developments face only one permitting process, rather than the two that would be likely encountered in constructing two separate buildings.

Tufts, in fact, specifically noted that they believe the permitting of their expansion went ahead more smoothly than it typically would, partially because they were adding height to an existing footprint, rather than expanding horizontally. Therefore, vertical expansion may have particular value in municipalities that have challenging permitting processes, such as Boston.

3.1.3 Subsurface Risk

One of the riskiest and most unpredictable parts of a construction project involves subsurface conditions on the site. Even though a variety of testing can be performed to identify and mitigate potential risks, surprises can nevertheless occur. However, with vertical phasing there is no additional subsurface risk for future phases. Vertical phasing provides a clean and controlled surface on which to build, an advantage not available in horizontal phasing.

Vertical expansion therefore can help avoid costs that would be incurred with a horizontal expansion. For example, Tufts decided to move ahead with their vertical expansion partially because it allowed them to avoid costly dewatering of a new site, which is common in the area of Boston in which the School is located. Areas that have challenging subsurface conditions may find vertical expansion to be particularly appealing, as it enables the developer to go into the ground only once.

3.2 Vertical Phasing and Corporate Real Estate

While we studied only four buildings in depth, through the course of our research, we were sometimes given suggestions of other buildings to examine or other professionals to contact who were involved with a vertically phased project.¹ While the expansion in most of these examples was not as significant as the ones detailed in our case studies; it is important to note that most of the examples we were given were of single tenant, owner-occupied buildings, such as used by hospitals, academic institutions, or large companies with significant real estate needs. It is possible that we just happened to come across a disproportionate examples of vertical phasing in corporate real estate, but we suspect that this is the real estate sector in which vertical phasing is most prevalent and perhaps beneficial.

Corporate real estate is often developed for reasons very different than that of a speculative developer. While a company will develop its own real estate with financial motivations in mind (e.g. cheaper to develop and own its own building than rent office space), typically corporations are motivated to develop a building by drivers different than those of a typical developer. Corporate real estate is primarily developed to support the operations of the organization. In addition, there tends to be a number of other sources of value that vertical phasing brings that may be more difficult to quantify. In addition to the general benefits of a vertically phased development approach, the following are additional sources of value that can be important specifically for corporate real estate.

3.2.1 Preserve Employee Transportation Patterns

For a company that anticipates its real estate needs to grow, vertical expansion can assure that a company can maintain facilities that are convenient to its employees. If a company fully occupies a building without the capacity to expand vertically, when the company's needs outgrow the size of the building, it risks not being able to find or develop new space that serves both its space and location needs without disrupting the transportation patterns of its employees. Vertical expansion better enables a company to meet both of these objectives.

¹ Additional examples of vertically phased buildings include: the Gwinnett Medical Center, in Lawrenceville, Georgia; the SUNY University Hospital at Upstate Medical University in Syracuse, New York; the University Hospital at the University of Utah in Salt Lake City, Utah; the Harris County Parking Garage in Houston, Texas; and Central Park in Burnaby, British Columbia.

Citigroup purposefully located Court Square Two along the E subway line in New York as it is their corporate real estate policy to locate all of its offices along this subway line. Citigroup considers it to be an effective way for its employees to travel between offices, as well as for employees to get to work. By continuing to locate along the E subway line and incorporating flexibility into the design Court Square Two, Citigroup will be able to ensure that its employees commute to work will remain the same as the company's space requirement increases.

HCSC, when it was planning its initial building, conducted an internal survey and discovered that a significant number of its employees commuted to Chicago through what is now called Millennium Station, located within a couple of blocks of the current building. For HCSC, it was important that its new headquarters be located near this station; it did not want to risk losing a significant number of its employees just for the sake of an address change. By incorporating vertical expansion, HCSC was able to accommodate its location needs while meeting its space needs into the foreseeable future.

3.2.2 Co-location of Employees

Companies and organizations often find significant value in keeping all of their employees under one roof. While difficult to quantify, this desire can be a significant driver in deciding to expand a building vertically.

Citigroup mentioned that it wanted to be able to create a campus feeling at Court Square Two without having to build separate buildings. Citigroup already had 5,500 employees located in Long Island City and felt it important to develop Court Square Two so that they could capitalize on the presence of Court Square One and create the flexibility to expand the campus as the company grew.

Tufts finds the educational process is enhanced by being able to locate all of their faculty and staff within one building because it facilitates interaction. Co-location of the faculty and staff was one of the main drivers that led Tufts to vertically expand its building rather than expand horizontally elsewhere.

HCSC hired a consultant to evaluate their business lines to determine which ones needed to be housed under one roof. Based upon this assessment, as well as internal corporate planning, the company determined the size of the original building. The vertically phased development approach allowed them to meet their needs in 1996, and continue to keep these units under one roof as their staff expanded.

3.3 Vertical Phasing and Non Owner-Occupied Buildings

While three of our four case studies were owner occupied buildings, as evident from the Bentall Five case, a vertically phased development approach can be highly successful in a multi-tenant building. However, with multi-tenant buildings, communication and planning are critical to implement vertically phased development successfully. As Bentall Capital did, the developer must clearly communicate to the tenants of the initial phase that the future phase may occur, outline how the construction could occur and indicate that the developer thought through the potential issues that could impact the tenant's operations.

Bentall Capital prevented tenant discomfort by developing the construction plan for Phase II prior to leasing Phase I. As such, each of the tenant leases in Phase I included a clause stating that Phase II could occur and that disturbance from the construction of Phase II would not nullify their lease. The lease clause disclosed the probability of Phase II construction and set out certain parameters, including construction related details, overhead protection and staging of Phase II. It is interesting to note that the construction of Phase II occurred prior to any lease rolling over in Phase I. Bentall Capital reported that they did not have to provide any concessions to the tenants of Phase I during the construction of Phase II. As the experience of Bentall Five shows, vertically phased development can be successful in both a multi-tenant building and an owner-occupied building.

3.4 Vertical Phasing with Hotel and Residential Uses

As shown by Bentall Five, vertical phasing can be a viable development approach for a multi-tenant building. However, we believe there are limitations to its applicability with respect to

non-office product types. All of the cases we researched involved office or institutional uses that are only occupied during traditional business hours. The nature of occupancy of office and institutional buildings gives developers the opportunity to conduct noisy or potentially disruptive construction activities during non-business hours when the buildings are less occupied or empty. In every case this opportunity was identified as a key to constructing future phases without hindering the operations of the tenants in the lower levels of the building. In residential or hotel buildings the opportunity to have the building empty does not exist. Since residential and hotel users do not have a uniform occupancy schedule (i.e. rooms and homes can be occupied at all hours of the day), no window of opportunity exists when the construction team can conduct the disruptive activities and minimize the disturbance to the lower level tenants.

However, we do believe that vertically phased development could be used with a mixed-use development where the lower levels are occupied by office and/or retail uses and the future phases are occupied by hotel or residential uses. In this scenario the construction activities will occur before the occupants of the residential or hotel uses occupy the building, and there is no limitation in conducting the noise generating activities. Residential and hotel uses can only be included in a vertically phased development if they are programmed for the later phases.

Chapter 4: Conclusion

Buildings with significant vertical expansion capabilities are currently rare, but we believe an opportunity exists for the practice to be replicated more widely. Throughout this paper, we have illustrated the process through which four buildings became vertically phased, including the conditions and objectives that make vertical phasing viable, and key considerations in its implementation.

Vertical phasing introduces a number of unique challenges in the planning and construction of a building. All of the buildings we studied encountered difficulties somewhere along the development process. However, in all cases, these difficulties were overcome, and development was able to move forward.

While identifying the opportunities and challenges demonstrates the applicability of vertical phasing, we believe that vertical phasing would be more compelling if its financial advantages could be clearly communicated. Demonstrating that vertical phasing leads to a greater expected net present value was not the subject of this paper, but has been demonstrated by de Neufville et. al. (2006). Doing so, however, requires real options analysis, which is not a valuation method typically used by developers. The difficulty in quantifying the benefits of vertical phasing to developers in a commonly understood language is, we believe, a barrier to its more widespread implementation.

Therefore, we believe vertical phasing has been more commonly seen in corporate real estate because organizational objectives which bring less quantifiable value to buildings outweigh financial and logistical concerns. While we believe that vertical phasing can be replicated more widely, we wish we had been able to identify more multi-tenant buildings to study.

One challenge that we believe may hinder the broader applicability of vertical phasing is the reluctance of equity and debt providers to fund the premium required for vertically phasing. Since each of our projects was financed entirely through internal sources of cash or used non-traditional sources of debt, we were not able to investigate this potential financial barrier.

Despite this, however, we nevertheless believe that, under the right circumstances, vertical phasing can be an attractive option for developers.

In many ways, the challenges associated with vertical phasing are not significantly different from those typically found in development. For example, projects often have entitlement issues surrounding zoning and permitting. Developers will typically mitigate this risk by making sure the proper entitlements are in place before land acquisition. Even so, permitting requirements and code changes can take place between land acquisition and building permitting, so there is always a chance that a developer cannot build the exact product originally envisioned at land acquisition. Entitlement issues are more complicated with a vertically phased building, because the proper entitlements needs to be in place not only at the time of construction, but also in perpetuity to guarantee that the option to expand can be exercised at any point in the future. Nevertheless, this right was secured in each of the buildings we examined, and changes in permitting requirements and building codes complicated, but did not prevent, vertical expansions from moving forward.

Likewise, a vertically phased building introduces numerous challenges to² both the design and construction process. Building projects, however, often face numerous potential design and construction issues that must be overcome. Unexpected subsurface conditions could lead to higher foundation costs. Community opposition could force building design changes that make it difficult to maximize the value of a parcel of land. The complexity of vertical phasing introduces unique issues, and the projects we examined partially overcame this by using consultants who were top in their fields. Vertical phasing, due to its rarity, may require superior talent, but can occur with relative ease if the proper skill sets are in place.

However, since the specific challenges of vertical phasing are unfamiliar and it is uncommon, we believe that most developers are therefore wary of considering vertical phasing for lack of examples to learn from or a tangible understanding of the financial benefits of flexibility. Our hope is that this thesis, by discussing four different vertically phased buildings, demonstrates that vertical phasing has and can be done successfully.

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Appendix

Case Study: Health Care Service Corporation Building Chicago, Illinois

The information in this case study came from several in-person interviews with individuals involved in the project during a visit to Chicago, Illinois from June 10 to 12, 2008, in addition to information gathered from a presentation regarding the subject building held on the MIT campus on April 17, 2008.

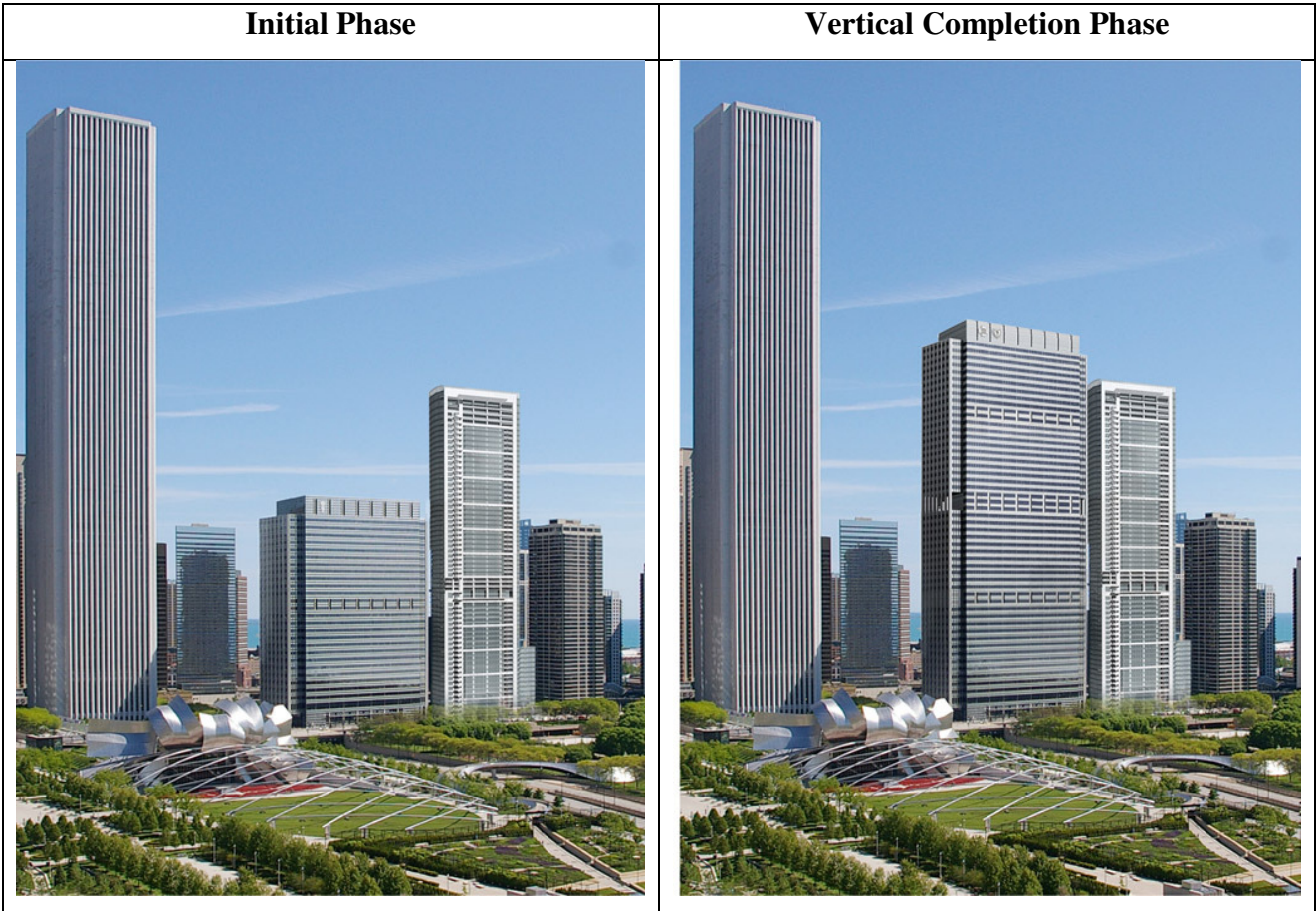
The individuals we spoke with during our visit to Chicago include:

- Andrew Pini, Divisional Senior Vice President, Corporate Real Estate and Development, Health Care Service Corporation
- Joseph Dolinar, Partner, Goettsch Partners
- Jim D’Amico, Vice President, The John Buck Company
- Lou Rossetti, Senior Project Manager, Walsh Construction
- David Eckmann, Principal, Magnusson Klemencic Associates
- Bud Spiewak, Senior Vice President, Director, Cosentini Associates

Individuals at the MIT presentation included Andrew Pini, Joseph Dolinar, Jim D’Amico, David Eckman, and:

- James Goettsch, Partner, Goettsch Partners
- Matthew Walsh, Chairman, The Walsh Group

Figure A.1: Renderings of HCSC, Initial Phase and Vertical Completion Phase



Source: Goettsch Partners, 2008

Project Description

The Health Care Service Corporation building, located at 300 East Randolph Street in downtown Chicago, Illinois, across the street to the north from Millennium Park, is currently undergoing its “vertical completion” from 30 to 54 stories (above ground). **Figure A.1** above illustrates the expansion. The original 30 story building was completed in 1997 as a new headquarters for the company.

The building has a footprint of about 36,000 square feet, and the original 30 story building had a gross area of 1.4 million square feet. It has the second largest footprint of an office building in Chicago, after the Sears Tower, which currently is the tallest building in the United States, and was for many years the tallest in the world.

The 24 story vertical expansion consists of an additional 880,000 square feet, bringing the gross area of the completed 54 story building to 2.3 million square feet. The vertical completion began in 2007, and is slated to be completed in 2010.

Decision to Phase Vertically

Owner Vision/Requirements

HCSC began to investigate options for a new headquarters in 1991. At the time, HCSC employed 3,000 people, who were housed at Two Illinois Center, about three blocks from the subject building, in 500,000 square feet of leased space. The company had to vacate this space by September 1997 or incur a \$14 million penalty.

In determining the company's future space needs, HCSC conducted both an internal assessment, and engaged an outside consulting firm to evaluate its space needs. The consultant was used specifically to assist with determining which units from an operational perspective needed to stay under one roof. The consultant's study, along with corporate planning, allowed them to forecast employment levels in the future.

Based upon these assessments, HCSC forecasted its workforce to increase to 7,200 employees by 2015. In considering future space needs, they determined that they wanted the ability both to expand and contract, which is difficult to do in a multi-tenant office building. This need and desire for flexibility is what led to the idea of a building that could be built vertically, in phases.

HCSC felt it was important to remain in downtown Chicago rather than a suburban location where the ability to expand horizontally could have been more feasible. A significant number of their employees at the time commuted to work through what is now called Millennium Station, which is located a couple of blocks from their current and former headquarters. A move to the suburbs would have made it unfeasible for a large number of these employees to come to work. The company did not want to create a situation in which it would be losing a large number of its employees; it felt that the cost of disrupting employee operations was too great and did not want to risk laying off or losing a large number of employees just for a change in address.

HCSC also felt it was important to own a building rather than continuing to rent. While the corporate real estate department approaches the construction of a building from a developer's perspective, HCSC, as a health care insurance company, does not view real estate as an investment. They prefer to own their buildings when they can, because it gives them the ability to better control their real estate, provides them flexibility, and believe owning a building is a sign of strength. In addition, they view owning real estate as cheaper than leasing. Therefore, they tend to shift to ownership when their capital needs provide them the opportunity to do so.

The HCSC Board approved the "vertical completion" in August 2006. There were no specific established triggers for the expansion. HCSC was at a point where a significant number of staff was again being housed in nearby leased office space.

HCSC originally considered expanding in 2001 when they came across a major tenant who was interested in occupying 10 to 12 floors of space, and would pay for a significant portion of the future expansion. HCSC decided that they could not move forward with the completion at the time because they needed their required capital for other purposes.

Land Purchase

The ability for HCSC to purchase land at a relatively low cost was crucial to their ability to construct a building with vertical phasing. 100,000 square feet of land was purchased in 1993 at a cost of \$230 per square feet, for a total cost of \$23 million. This same land had originally been listed in 1989 at a cost of \$390 per square feet.

The purchased land was part of a PUD, and the owner had the ability to transfer FAR around the site. HCSC negotiated an FAR of 18, because an FAR higher than this would have triggered a contribution to a \$42 million park to be constructed behind the building in the future.

Zoning and Permitting Conditions

There were no particular zoning or permitting conditions that created challenges in terms of planning a vertically phased building. However, HCSC did receive a letter in November 1994, signed by the commissioner of the Chicago Department of Planning and Development, that stated the zoning and permitting conditions that were in existence at the time would be applied to

the building should the vertical option be exercised. The City of Chicago was under no obligation to grant HCSC this letter. However, it is believed they did so to some extent as an incentive for the company to continue to maintain its headquarters in the City.

It is important to note that the City's letter could only lock in zoning and permitting laws at the City level. HCSC therefore bore the risk of changes in any codes that took place at a higher level.

Despite the fact that HCSC had a letter from the City that provided them with the right to expand vertically, they worried to some extent that this option would run out. The area immediately surrounding the building, which in the mid-1990's had been envisioned to be occupied by office buildings, had instead been filled with residential high-rise buildings. As the only office building on the block, the company worried that the residential nature of the surrounding area could possibly interfere with their plans to expand.

Market Conditions

At the time HCSC purchased the land for the building in 1993, Chicago, along with much of the rest of the country, was experiencing a severe real estate downturn. The soft market allowed HCSC to purchase land at less cost, as noted earlier, and apply the savings into the cost premium required to construct the building with the ability to vertically expand. In addition, HCSC felt that the soft market conditions would not enable them to lease out the excess space, should they have built the entire building during the initial phase.

Vertical Phasing Conditions

Design

HCSC found it difficult to locate an architect who was willing to build a vertically phased building. Goettsch Partners, however, was interested in the idea. There are numerous design considerations when designing a building with the ability to be vertically phased. The major design considerations are as follows:

Floorplate

A typical spec office floorplate ranges from 25,000 to 30,000 square feet. The HCSC building, on the other hand, has a floorplate of approximately 36,000 square feet. This larger floorplate facilitated designing a building with vertical expansion capabilities.

Foundation

All buildings that are built to be vertically phased need to have the foundation in place to support the fully completed building. As a result, the foundation was in some sense “overbuilt” during the first phase so that it could support the weight of the second phase without subsequent reinforcement.

Columns

All buildings that are built to be vertically phased have to have the proper columns in place to support the fully completed building. At the HCSC building, and shown in **Figure A.2**, the rebar extended upward and out of the columns on top of the 30th floor to connect to the vertical completion phase.

Figure A.2: Rebar Extending Through the Roof of Initial Phase of HCSC



Source: Goettsch Partners, 2008

Curtain Wall

One of the key issues with any building that is constructed vertically in phases is whether the curtain wall will be able to be exactly replicated at a future point in time. The HCSC team was not significantly concerned by this, as they believed the field was competitive enough that they could find multiple acceptable suppliers, especially from China. The HCSC team conducted a bidding process in the vertical completion phase, which included a bid from the curtain wall manufacturer of the original phase. The team was able to achieve a less expensive bid from a different manufacturer, which they chose to move forward with. While the curtain wall of the second phase looks identical to that of the first, it functions very differently. To date, the team has had no significant difficulties with the new curtain wall system.

Elevator

Tall buildings tend to have at least two separate sets of elevators, with one set serving the lower floors, and the other set serving upper floors. When vertically phasing a building, the height of the first phase serves as a natural point for the limit of the lower story elevators. However, the building must be able to accommodate the installation of express elevators at a later point in time.

Typically, elevators are contained in shafts within the core of a building. At the HCSC building, however, the elevators were kept outside the core and instead are housed within glass atriums in the building. As a result, the elevator cabs are visible throughout the interior of the building, as shown in **Figure A.3**.

This method was primarily chosen because it alleviated the need to construct an elevator shaft for the express elevators in advance of construction of the vertical completion phase. This resulted in a reduction in the up-front premium of constructing the building to accommodate vertical expansion.

Instead of elevator shafts, large 30 story atriums were constructed inside the building that were left empty until the construction of the expansion commenced. During the expansion, rails were then placed in these atriums for new elevator cabs to serve the upper floors. As a result, elevator installation materials and work can be seen on the interior of the building from all floors.

However, no resulting noise was observed during our visit. This method was pursued primarily as a cost-saving measure to save the expense of installing elevator shafts in advance of their need.

Figure A.3: Elevators within the Atrium of HCSC.



Source: Goettsch Partners, 2008

Selection of Stone

In addition to the glass curtain wall, the exterior of the building is adorned with a gray granite. In choosing a stone to use, the HCSC team had to be careful to do so from a quarry that had a large and consistent enough supply of stone so that at any point in the future they could be guaranteed access to stone that looks identical to that of the original building.

Construction

In terms of constructing the expansion, the accommodations that were made during the original construction of the building have for the most part been adequate, and construction has largely gone as planned. However, as with any major construction project, unexpected construction challenges arise. In particular, the construction team found it more difficult than expected to

begin the vertical expansion from the top of the original building; the process was more complex than anticipated. The challenges encountered were great enough that in the end the team decided to construct a new floor above the original roof, so that the first floor of the expansion was raised slightly over what had originally been planned.

In addition, the development team found that they could not deliver concrete and fire protection materials to the top of the building as originally planned. As a result, they had to install two pipes, one for each use, to deliver these materials to the top of the building.

Project Team

Most of the development team from the original building, including the architect, general contractor, and MEP engineer, were used in the building's expansion. However, one of the critical team members, the structural engineer, was changed. This change in the structural engineer was viewed to be advantageous, because the new structural engineer was able to take an independent look at the original structural work, which both increased confidence in the expansion process, and brought some new approaches to save structural materials in the construction of the expansion.

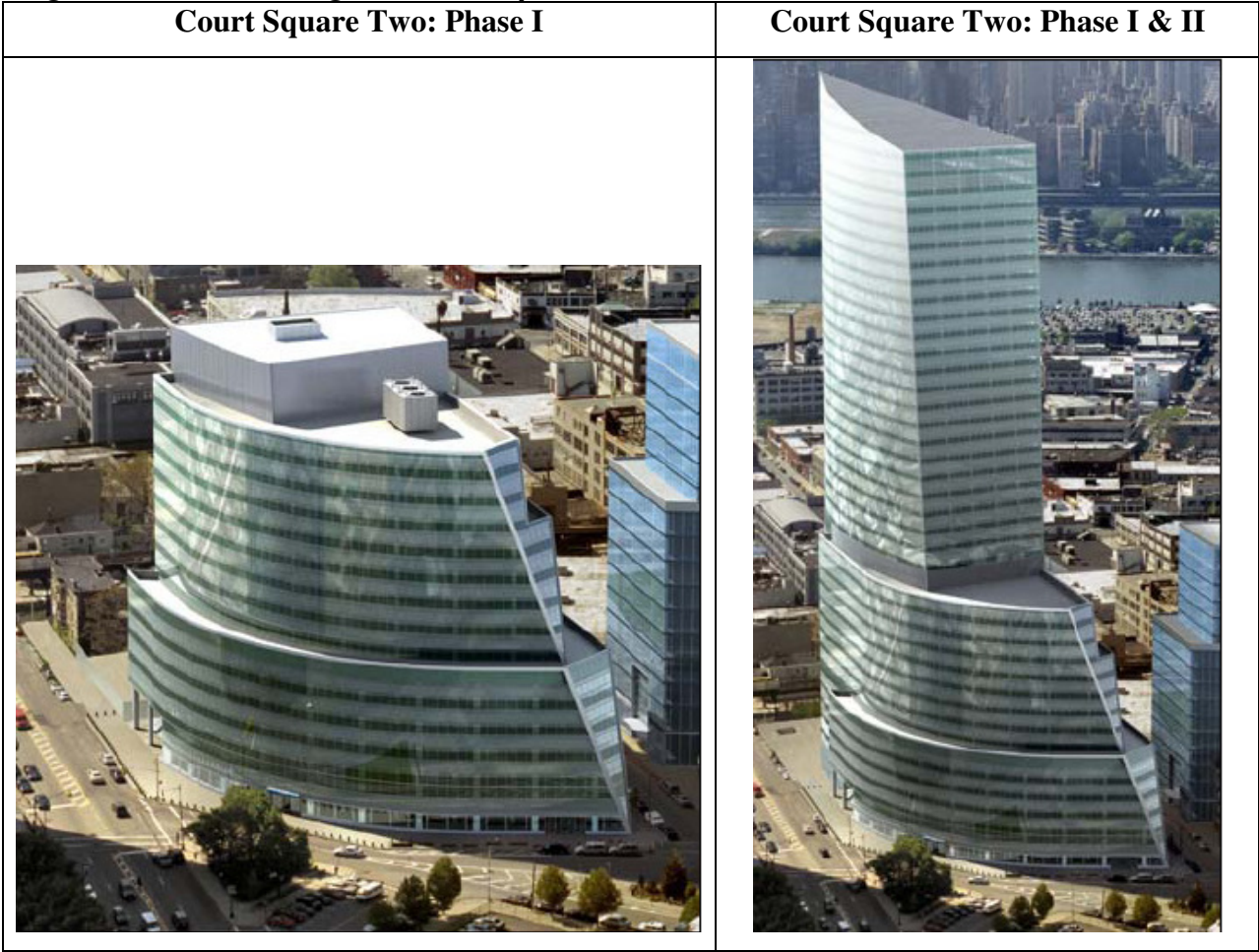
Financing

The cost of both the original building and expansion are being funded entirely with HCSC capital; they have not raised outside equity or incurred debt to develop the building. HCSC estimates the premium to incorporate vertical expansion to be 10 percent to 13 percent of the construction cost of the original building.

Case Study: Court Square Two
Long Island City, Queens, New York

Unless otherwise noted, the information in this case study came from in-person interviews with and other information provided by Scott Beadle, Senior Director of Design and Construction and Philippe Visser, Senior Director, of Tishman Speyer and Tom Santiago, Managing Director, Northeast Region Head, of Citi Realty Services. An initial interview and tour of the subject building with Scott Beadle was held on May 29, 2008, and a subsequent interview with Scott Beadle and Philippe Visser was held on June 6, 2008. The interview with Tom Santiago was also held on June 6, 2008.

Figure A.4: Rendering of Court Square Two Phase I and Phases I & II



Source: Source: Kohn Pedersen Fox, 2005

Project Description

Court Square Two, owned by Citigroup, is part of the Citigroup Campus located one subway stop from midtown Manhattan in Long Island City, Queens. The Citigroup Campus is comprised of Court Square One and Court Square Two. Court Square One is a 1.5 million square foot facility that is home to approximately 5,500 Citigroup employees. Completed in 2007, Phase I of Court Square Two is 15 stories high and contains 490,000 gross square feet. The building has the ability to expand both vertically and horizontally to 36 stories and 1.4 million gross square feet. **(Figure A.4)** Tishman Speyer was the fee developer on the project, Turner Construction was the construction manager and Kohn Pedersen Fox was the architect.

Upon full completion, Court Square Two will contain 1.4 million gross square feet and house more than 4,500 Citigroup employees, a training center, employee cafeteria and a retail bank branch. Completed in August 2007, Phase I achieved a Gold LEED certification and cost approximately \$175 million to construct (included in the cost was construction of a required subway improvement). The total development cost for both Phases is anticipated to exceed \$500 million (excluding land costs).

The total lot size of Court Square Two is approximately 79,000 square feet. Phase I was designed to function as an efficient independent building should the building not be expanded. Phase II will include both a horizontal and vertical expansion. The horizontal expansion will include expansion of the 15 original floors, creating center core floor plates of 39,700 gross square feet to 66,500 gross square feet. The vertical expansion will increase the building to a height of 36 stories. As of June 2008, a timeframe for construction of Phase II has not been set.

Citigroup and Long Island City

Citigroup is the largest private employer in New York City with over 28,000 employees located throughout the five boroughs of New York. Citigroup acquired the land for Court Square One and Court Square Two in 1986 and moved to Long Island City in 1989 when they constructed the 48 story Court Square One building. Citigroup's move to Long Island City in 1989 marked the development of the tallest building in New York City located outside of Manhattan and was viewed as a potential stimulus to developing a commercial district within New York City that

could compete with Jersey City. However, the development failed to jumpstart the business district in the way the city officials had hoped.

Long Island City is New York City's fourth business district, after Midtown, Lower Manhattan and Downtown Brooklyn². As of 2007, it was home to 80,000 jobs and more than 25,000 residents.³ The commercial core of Long Island City is a 37-block area bonded by Queens Plaza to the north and Court Square to the south. Historically an industrial zone, the area was rezoned for commercial and residential use in 2001.

In recent years development, both residential and commercial, has started to occur in Long Island City. Metropolitan Life Insurance Company signed a 20-year lease in Long Island City in 2002, and the United Nations Credit Union constructed a 220,000 square foot office building next to the Citigroup Campus in 2006. In addition, Tishman Speyer is planning Gotham Center, a 3.5 million square-foot mixed-use complex at the current location of the Queens Plaza Municipal garage on Jackson Avenue.⁴ In spring 2008, Rockrose Development Corporation announced 10 Court Square, a Skidmore Owings & Merrill-designed 800,000 square foot built-to-suit office building.⁵ The Long Island City Business Improvement District is tracking between eight million and 10 million square feet of total development in the 37-block commercial core. The district estimates that there are 4,000 apartments completed or under construction and five million square feet of office development.⁶ While there is a significant amount of development in the pipeline, the Citigroup Campus commands the largest presence in Long Island City, as shown in **Figure A.5**.

² Thomas Cogan. "Real Estate VIPs Call LIC 'Hands Down' Winner." Queens Gazette May 28 2008. July 2008 <http://www.licbdc.org/licbdc/area_business_news.html?Year=2008&AID=819>.

³ New York City. New York City Economic Development Corporation. LONG ISLAND CITY - When You're Here You're There. July 2008 <<http://www.nycedc.com>>.

⁴ John Lauinger. "LIC Office Tower to Replace Municipal Garage." NY Daily News May 27 2008. July 2008 <http://www.nydailynews.com/ny_local/queens/2008/05/27/2008-05-27_vacant_long_island_city_garage_might_go_.html>.

⁵ Steve Cuzzo. "Rockrose Office Tower for Court Square." NY Post June 17 2008. July 2008 <http://www.nypost.com/seven/06172008/business/citi_tower_will_get_neighbor_115912.htm>.

⁶ Michael Stoler. "Long Island City Finally Reaches Critical Mass." NY Sun Oct. 4 2007. July 2008 <<http://www.nysun.com/article/63967>>.

Figure A.5: Rendering of Citigroup Campus, Long Island City, 2006



*The building on the far right is the United Nations Credit Union which was under construction in 2005 and completed in 2006.

Source: Kohn Pedersen Fox, 2005

Decision to Phase Vertically

Owner Vision/Requirements

Citigroup has controlled the Court Square Two site since 1986. In the early 2000s Citigroup was experiencing significant growth in the consumer business units, credit card and retail banking divisions. At the time Court Square One housed the North America units for all of retail banking, and it made sense to keep these divisions in Long Island City. In addition, lease rates in

Manhattan were increasing rapidly, which further reinforced Citigroup's decision to keep these divisions in Long Island City.

As such, Citigroup approached Tishman Speyer to assist in creating a development approach that would meet Citigroup short-term and long-term growth projections, in addition to maximizing the value of the land. Initial conversations between Citigroup and Tishman Speyer started in 2000 and 2001. Originally, the project was intended to be a joint venture between Citigroup and Tishman Speyer. However, by January 2005, Citigroup decided to proceed with Phase I of the building only and contracted Tishman Speyer as the development manager.

Since Citigroup owned the development rights to the full lot they wanted to maximize the development; however, they did not have an immediate need for the full 1.4 million square feet allowed under the current zoning. After several discussions between Tishman Speyer and Citigroup, the plan to develop the building over two phases was created. Citigroup only had an immediate need for 400,000 to 500,000 square feet. Thus it was determined, through discussions with the architect, that the 15 story podium portion would meet Citigroup's immediate need and that the building would be designed and constructed to allow for future vertical and horizontal expansion that would capitalize on the allowable FAR.

As described above, Court Square Two includes both a vertical and horizontal expansion. Phase II is technically an overbuild of Phase I, with one-third of the tower located on top of the 15 story "podium". Citigroup did not want to do a full vertical expansion as they had an unpleasant experience building over a one story bank branch on the Upper East Side of New York. Citigroup sold the air rights above the bank branch to a residential developer. The original building was not designed to support an additional nine stories. The expansion was not a smooth one and Citigroup lost business and employees during the expansion. This development left Citigroup wary of doing a full vertical expansion and thus they decided to do an overbuild which includes both a vertical and horizontal expansion.

Zoning and Permitting Conditions

At the time that Citigroup acquired the land for Court Square One and Two, the land was rezoned from an FAR of 2 to an FAR of 15. Included in the rezoning was the stipulation that if Citigroup decided to build on the Court Square Two parcel they would have to fund the subway station improvement connecting the G and E lines at Court Square Station. Citigroup did not receive any discretionary tax breaks for building in Long Island City.

Citigroup, when planning the first phase of Court Square Two, knew that the building codes in New York City were changing in 2008. As a result, they chose to build the first phase to the new code, even though they believed the building could have been grandfathered under the old code. Building codes rarely change in New York City and the Citigroup development team is confident that the new codes will be in place should the option to construct Phase II be exercised.

Market Conditions

Market conditions were a significant driver in Citigroup's decision to construct Court Square Two in phases. Long Island City, less than a 10 minute subway ride from midtown Manhattan, is a developing commercial area and commands rents that are significantly less than in Manhattan. In recent years there has and continues to be a significant amount of development in Long Island City; however, the rents and the amount of commercial space is significantly less than in other business districts in New York City. While Citigroup only had a need for 400,000 to 500,000 square feet of space, the market in Long Island City would not have been able to absorb an additional one million square feet if Citigroup had constructed the entire 1.4 million square foot building in the initial phase.

Furthermore, Citigroup decided to locate and continue to house the growing business units in Long Island City as rents were 300 percent higher in Manhattan. Citigroup has a corporate real estate policy to locate all of their offices along the E train. This significantly limits where they can rent space; however, it enables them to efficiently manage their corporate real estate as no single office is more than two subway stops from each other, and it is rather easy to travel between offices. In effect the E train is Citigroup's "horizontal people mover".

Vertical Phasing Conditions

Design

As stated previously, Court Square Two includes both a vertical and horizontal expansion. Phase I is considered the podium upon which the Phase II tower will partially sit. Should the expansion option not be exercised and the tower not constructed, Phase I was designed to function as an efficient independent building. There is approximately 18,000 leasable square feet of retail space on the ground floor of Phase I, the 15 story podium. It was envisioned that this retail space would include a Citigroup branch office and coffee shop; however, as of May 2008, the space is vacant. Amenities in Phase I include a 400-seat training center and a 300-seat auditorium located on the 2nd and 3rd floors. Citigroup plans to use this complex for both local and regional training seminars. Included in Phase I was the construction of a single basement level which houses the heating and cooling plants, electrical distribution rooms, and building operations space. The building lobby is designed to include a separate entrance to the training center.

Phase II will include both a horizontal and vertical expansion. The horizontal expansion will include expansion of the 15 “podium” floors, creating center core floor plates ranging from 39,700 gross square feet to 66,500 gross square feet. The vertical expansion will include a tower from floors 16 to 36 that will extend over the Phase I podium by two structural bays with floor plates of 23,900 gross square feet to 26,500 gross square feet. Phase II amenities may include a full cafeteria designed to accommodate all of the employees at the Long Island City campus (approximately 10,000).

The exterior western wall of the 15 story podium is referred to as the “phasing wall” and will be demolished when Phase II is constructed, allowing the floor plates of the 15 “podium” floors to almost double in size. There is approximately a five foot separation from the phasing wall and the western interior wall of Phase I. When Phase II is constructed the construction team will demolish the phasing wall floor by floor in order to connect the horizontal expansion of the

podium floors. Citigroup estimates that it might lose a row of cubicles when the phasing wall comes down.

With respect to elevators, the tower elevators will be constructed in Phase II and are located in the horizontal addition, adjacent to the existing elevator bank. When the building is expanded, the existing exterior phasing wall adjoining the elevator bank will be removed, thereby combining the old and new elevators into one larger bank. This strategy avoids the expense of installing elevator shafts before they are needed, and avoids most of the logistical challenge of providing for these future shafts within the building.

A large concern for developers is ensuring that the extension of the building has an identical appearance to that of the original building. Even though glass is relatively easy to replicate, all curtain wall systems are to some extent custom. The curtain wall design is easily replicable and was selected to ensure that the façade of the two phases would appear to be the same should the fabricator of the curtain wall of Phase I not be the fabricator of the curtain wall of Phase II.

The wedding cake design of the building was used to preserve sightlines of Manhattan, which was a requirement of the city.

Construction

Construction of Phase I took 21 months. Construction commenced in December 2005, with a certificate of occupancy received in April 2007 and Citigroup occupying the space in August 2007. Prior to construction of Phase I, Tishman Speyer, along with Turner Construction, developed a detailed plan for how they were going to construct Phase I and Phase II.

When the decision to exercise the option on Phase II is made, Citigroup envisions that they will conduct an extensive communication plan with the occupants of Court Square Two prior to the start of construction of Phase II. When the phasing wall is demolished and the podium floors are connected to Phase II, Citigroup anticipates that they may lose approximately a row of cubicles on each floor. As demolition of the phasing wall may create a significant amount of noise, it is anticipated that the work may be conducted during non-business hours.

Project Team

It is anticipated that the project team will remain the same should Citigroup elect to exercise their option to develop Phase II. During the construction of Phase I, Tishman Speyer believed that the development of Phase II might occur directly after the completion of Phase I. In a preemptive measure to minimize cost escalation, Tishman Speyer bought options from key trades for Phase II. However, as time has passed, and there is no indication as to when or if Citigroup will proceed with Phase II, many of the options have expired and rebids for all of the trades will need to occur.

With respect to project team continuity, the significant concern is the curtain wall. While the material is universally available, Tishman Speyer wants to have the same subcontractor do Phase I and Phase II to maintain uniformity. However, there is concern in stating the desire to have continuity in terms of subcontractors, as it could reduce the opportunity for receiving a fair market bid for the work. Tishman Speyer has similar concerns regarding the elevator system and the stone used in the lobby.

Financing

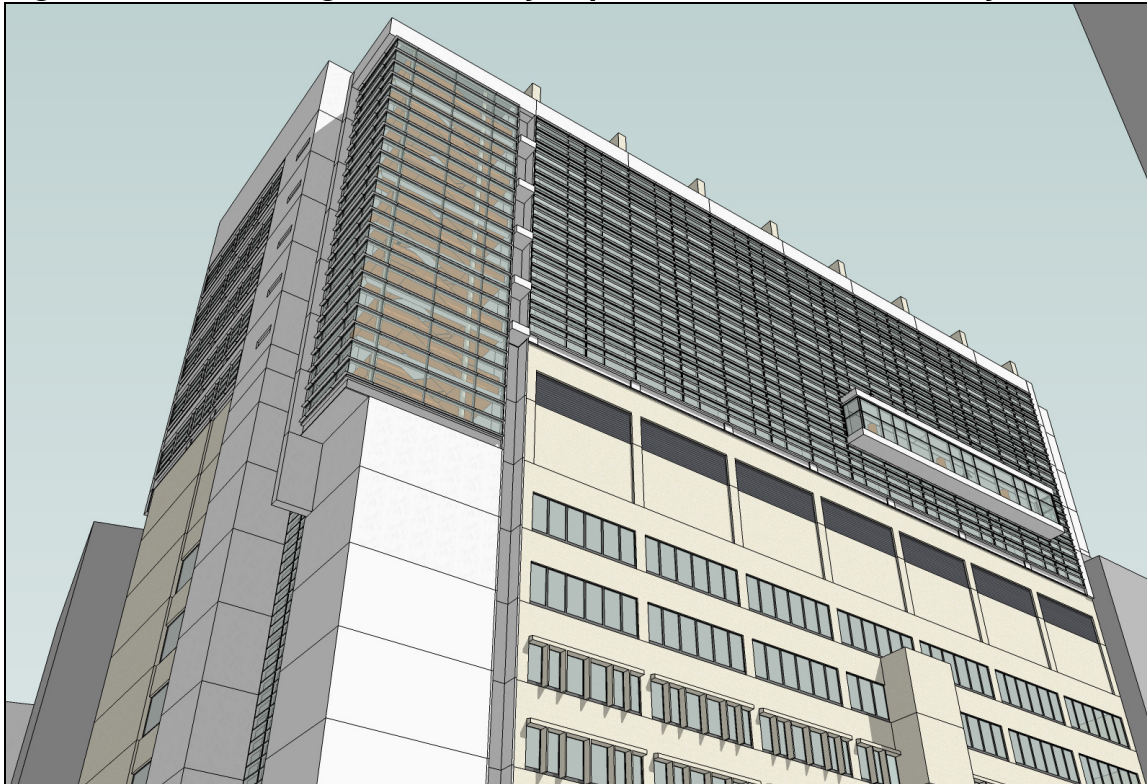
Citigroup financed the building and paid for it entirely in cash, which Citigroup felt important to do. Phase I cost approximately \$175 million to construct. Citigroup estimated that the premium to phase was 7.5 percent. This figure is low because Court Square Two, as both a vertically and horizontally phased building, initially constructed only one-third of the structural support needed for construction of Phase II. If this infrastructure was installed in Phase I, the premium would have been much greater.

Citigroup did not use real option analysis to value the project. Currently on their books the property is valued as the value of the 15 story podium building plus the land value of the undeveloped portion of the parcel (approximately 35,500 square feet).

Case Study: Tufts University Dental School **Boston, Massachusetts**

The information in this case study came from in-person interviews with Joseph Castellana, Executive Administrative Dean at the Tufts University School of Dental Medicine, and John Roberto, Vice President of Operations at Tufts University. An initial interview with Joseph Castellana was held on May 27, 2008, and a subsequent interview and tour of the subject building was held on June 25, 2008. The interview with John Roberto was held on May 28, 2008.

Figure A.6: Rendering of Five Story Expansion of Tufts University Dental School



Source: Architectural Resources Cambridge, 2008.

Project Description

The Tufts University School of Dental Medicine building, located at One Kneeland Street in Boston, Massachusetts, was completed in 1973 as a new facility for the Tufts University School of Dental Medicine. When the building was planned in the late 1960's, the school identified a need for a 16 story building at the site, but had neither the program to support nor the funds to build the structure to its fully intended and approved height. As a result, the building was permitted and built only to a height of 10 stories. However, the School was interested in constructing the building to its full height at a later time, and therefore constructed the building with the capacity to expand in the future.

The building has a footprint of 21,000 square feet, and the original 10 story building consisted of a total of approximately 178,346 square feet. The top two stories of the original building were designated as mechanical space, but since the building was not built to its full 16 stories, portions of these floors were fitted out for use by the School. The sections of these two floors that were fitted out will be reclaimed as mechanical space as the vertical expansion is completed.

The five story vertical expansion (as explained later, for structural reasons the building is being built to 15 rather than 16 stories) consists of an additional 105,000 square feet, bringing the area of the completed 15 story building to approximately 283,000 square feet. One floor will be shell space to be fitted out at a later time. The expansion, begun in 2008, is scheduled for completion in November 2009. **Figure A.6** on the previous page contains an illustration of the expansion.

The original building was designed by TAC (The Architect's Collaborative), with LeMessurier serving as structural engineer on the project, and Barr & Barr as the construction manager. The expansion was designed by ARC (Architectural Resources Cambridge), with LeMessurier again serving as structural engineer, and Shawmut as construction manager.

Construction costs of the original building are unknown. The vertical expansion has a total project cost of \$66.5 million, which consists of \$53 million in hard costs and \$13.5 million in soft costs. \$47 million of the hard costs are attributable to the vertical expansion, with the

remaining \$6 million attributable to required upgrades in life safety features of the original building.

Decision to Phase Vertically

Due to the length in time between construction of the expansion and when the building was originally planned, little information is known about how the requirements of the original building were determined. For example, it is not known how Tufts determined it wanted a 16 story building, or how it settled with a building of 10 stories. What is known is that the school was unable to afford to build a structure greater than the original 10 stories at the time. However, a number of factors led to the decision to begin expanding the building in 2008.

The school evaluated staying at its current location or duplicating the facility elsewhere. One of the important considerations in space needs was the knowledge that faculty and students can interact very easily when they are close together, so it was important for them to have the school contained within a single building.

The decision to move forward with the vertical expansion was an iterative process. It started in 2004 when Tufts commissioned the firm of Skanska to perform a feasibility study of the building's ability to expand vertically. This study was necessary since little data from the building's original construction remained. Once the study was completed, the School began determining the financial feasibility of expansion, and eventually obtained permission to proceed with design development. Once designs were in place, the School obtained additional bids on construction, and eventually received approval to proceed with construction in November 2007.

Owner Vision/Requirements

The dental profession and education has changed significantly since the early 1970's, which has been the primary driver for new and expanded facilities at Tufts Dental School. When the building was originally constructed, there were 120 pre-doctoral students per class. Today, there are 165 pre-doctoral students per class. During that same time period, full-time faculty increased from 25 to 105. Many new dental procedures and materials were developed in this time, leading to this significant increase in faculty and required space.

Zoning and Permitting Conditions

When the building was originally permitted, records at the Boston Redevelopment Authority showed it as a 15 story building, indicating that the building's full height had been discussed and negotiated when it was originally approved. As a result, Tufts did not have to pay for the additional FAR at the time of expansion.

It took about a year for the expansion to go through the City of Boston approval process, which is a relatively short period of time in this municipality. Tufts believes that the approval process was more benign than it might have been because individuals were less concerned with a building extending vertically. A horizontal build-out, they believe, would likely have been more of a concern. In addition, the Mayor of Boston felt the expansion was good for the City and wanted the project to happen, which likely contributed to the ease of the permitting process.

There were no particular zoning or permitting conditions that led to the decision to vertically expand. The owner acknowledged that the building code in Boston was about to change, and that under this new code it probably would not be possible to build to the planned 15 stories. However, this was not a factor in their decision of when to vertically expand.

Market Conditions

Since the expansion was constructed for the sole purpose of the use by Tufts University, leasing market conditions were not considered at the time Tufts decided to expand. However, there were some factors that they considered beyond the programmatic needs of the school. Specifically, Tufts felt that the escalation of construction costs was rising more quickly than the debt capacity of Tufts. In addition, the dental school was in a good place with the BRA, community, and the adjoining Tufts Medical Center. Due to these various reasons, the school felt it was a good time to pursue the vertical expansion.

Vertical Phasing Conditions

Design

Little is known about what, if any, design characteristics were put in place to make the building more appropriate for future vertical expansion. The building's façade is made of concrete, creating a look that is easily replicable at a later point in time. However, it is believed that this was not a design consideration of future vertical expansion, but rather just reflective of an architectural style that was popular in the early 1970's.

In fact, when designing the expansion, Tufts expressly chose a design that is lighter and airier than the base of the building. At the same time, Tufts wanted to make sure that the building did not create a look of having a hat on top. The plans for the new building were approved and signed off by the BRA in 2008, after going through a design and review process.

It is interesting to note also that while the building was originally permitted for 15 stories, at that time the building was not designed for its full expansion.

Construction

Tufts had some of the original structural drawings of the building, but no calculations were remaining. As a result, Tufts retained the firm of Skanska to perform an assessment of the capacity of the building to vertically expand.

The only significant feature in the building that prepared it for later vertical expansion was the installation of a foundation and columns that could support a full 16 story building, and the extension of the supporting columns above the 10th floor of the building so that new columns could be attached to them during the completion. The roof deck was otherwise constructed no differently than it would have been.

Otherwise, however, there were no obvious accommodations made in the building to support the future expansion. MEP systems, for example, were only adequate for the original 10 story building. No special accommodations were made for the four passenger and one freight elevators; these shafts are being extended to the height of the new building.

Due to new seismic codes, the expansion only went to 15 stories, rather than the original 16 stories that was planned. One benefit to removing the top story was that intrusions to strengthen the structural steel only had to be made on the first and second stories of the original building, rather than the entire building.

The original building had cooling towers on its roof that were relocated to another nearby building to continue serving the original. While there are no plans to move the cooling towers back to the original building, the new roof was designed to be strong enough to support cooling towers should they need to be moved back again in the future. This arrangement was made easier by the fact that these buildings already shared cooling towers.

One of the challenges and concerns that had to be dealt with was having construction workers passing through an occupied building. Shawmut, the general contractor, trained their staff on proper etiquette for behaving in an occupied building to prevent any possible problems.

Another general challenge to the construction has been dealing with the difficulties and added costs of staging construction in an urban environment. The density of the area meant that the construction team had to install the crane on top of the building rather than adjacent to it, due to two abandoned Massachusetts Bay Transportation Authority tunnels underneath. The construction team also needed to undertake a number of wind studies to make sure wind patterns were not altered due to the height of the expanded and surrounding buildings.

Project Team

Due to the long length in time between the original construction and the expansion, few of the team members involved in the design and construction of the original building were able to

participate in the expansion. The mechanical engineering firm that worked on the original building was still in business and was used again, which did help in the expansion process.

Financing

The cost of the original building is unknown, but it is known that it was financed through a combination of grant funds, public bonds, and a capital campaign.

The \$66.5 million expansion is being funded through three sources:

- \$38 million in debt financing through the issuance of public bonds.
- \$15 million from Dental School reserves, including two gifts of \$5 million and \$4 million that were not specifically earmarked for construction.
- The remaining \$13.5 million will come from fundraising gifts that range from \$100,000 to over \$1,000,000. Fundraising for the expansion is ongoing but is expected to exceed its goal, as donors are often interested in the opportunity to place their names on buildings and to support the school's mission.

The Dental School estimated that it would have cost \$360 million to build the entire space (all 15 floors) anew.

Case Study: Bentall Five
Vancouver, British Columbia, Canada

The information in this case study came from a phone interview with Tony Astles, Executive Vice President, British Columbia of Bentall Real Estate Services LP, held on June 18, 2008, and information published on the websites for Bentall Five and Bentall Capital. Additional internal documents were also provided by Tony Astles.

Figure A.7: Renderings of Bentall Five, Phase I and Bentall Five Phase I & II



Source: Bentall Capital, 2005.

Project Description

Bentall Five, located in Vancouver, British Columbia, is part of the two million square foot Bentall Center, the largest collection of Class AAA office space in Western Canada. Bentall Five is a multi-tenant building developed and currently owned by Bentall Capital, a large Canadian commercial real estate developer. As illustrated on the previous page in **Figure A.7**, Bentall Five was designed and developed to be built entirely at once or in two vertical phases. Due to market conditions, Bentall Capital elected to construct the building in two phases. The initial 20 story phase was completed in 2002. Phase II was completed in September 2007 and expanded the building to 33 stories.

Bentall Five was originally conceived in 1993 when Bentall Capital constructed a 618 stall, seven level underground parking structure in an effort to assemble the site that is currently home to Bentall Five. The original plan was to complete the land assembly and develop the parking garage to generate income until the market existed to develop additional office space within the Bentall Center complex.

To mitigate market risk, Bentall Five was designed to be built in either one or two phases. The building received approval from the City of Vancouver in 2000 and construction began on March 1, 2001. At the start of construction, the plan was to build the entire 33 story tower (34 floors, with no 13th floor). However, the design permitted the option to deliver the building in multiple phases. In January 2002, based on analysis of market conditions, Bentall Capital decided to construct only the first 20 stories or approximately 330,000 rentable square feet. Phase I was completed in September 2002 with floor plates of approximately 17,000 rentable square feet.

Construction of Phase II commenced in 2005 with tenants able to occupy Phase II in 2007. Phase II contains 13 floors and approximately 230,000 rentable square feet. The floor plates are slightly larger at 17,700 rentable square feet, due to the absence of lower level elevator shafts. Upon completion, Bentall Five is a 33 story building with approximately 560,000 square feet.

Bentall Center

The Bentall Center is comprised of five office towers, two multi-level parking garages; 53,000 square feet of retail and a Fitness and Racquet Club. The entire five acre site is located in the

heart of Vancouver's central business district, west of Burrard Street and north of Dunsmuir Street.

The project commenced in 1966 with the construction of Bentall One. Between 1966 and 1981, Bentall Capital developed the four tower complex. A major renovation of the retail mall was completed in 1999. In 2002 Bentall completed Phase I of Bentall Five with Phase II completed in 2007.

The following are basic descriptions of each of the five towers.

- **Bentall One** is a 22 story building located at 505 Burrard Street. The building was completed in 1967 and contains 250,000 square feet, with typical floor plates of 12,400 square feet.
- **Bentall Two** is an 18 story building located at 555 Burrard Street. The building was completed in 1969 and contains 170,000 square feet, with typical floor plates of 9,900 square feet.
- **Bentall Three** is a 32 story building located at 595 Burrard Street. The building was completed in 1974 and contains 480,000 square feet, with typical floor plates of 15,600 square feet. The building was renovated in 1994.
- **Bentall Four** is a 35 story building located at 1055 Dunsmuir Street. The building was completed in 1981, contains 550,000 square feet, with typical floor plates of 16,800 square feet. The building was renovated in 1998.
- **Bentall Five** is a 33 story building located at 550 Burrard Street. The building contains 560,000 square feet, with typical floor plates of 17,500 square feet. Phase I was completed in September of 2002, Phase II was completed in late 2007.

Bentall Capital

Bentall Capital is a fully integrated real estate service organization, with over 1,100 employees. Bentall has a 90 year track record as a builder and developer and a 40 year legacy in property management and leasing. Bentall Capital was founded and has headquarters in Vancouver, and has offices in Seattle, Calgary, Edmonton, Winnipeg, Toronto, Ottawa, and Montreal. Currently

valued at \$17 billion, Bentall Capital is fiduciaries for 83 million square feet of real estate and has invested in over 600 properties.

Bentall has developed over 40 million square feet of office, industrial and retail space in British Columbia. Bentall is one of the largest property managers in the province, and prides itself on its integrity, professionalism, and outstanding service to its tenants. Bentall has been routinely recognized for its excellences, the Building Owners and Managers Association (BOMA) of Canada awarded Bentall Capital the National Pinnacle Award and the National Association of Industrial and Office Properties (NAIOP) named Bentall Capital “Developer of the Year” in North America for 2006. In addition Bentall is routinely named one of the top 50 employers in Canada.

Decision to Phase Vertically

Owner Vision/Requirements

The decision to phase vertically Bentall Five and only construct the first 21 floors was a direct result of the events of September 11, 2001 and its effect on the North American economy. Bentall supported the decision to phase through a detailed analysis of absorption rates in Vancouver. Absorption for 2001 and 2002 was negatively impacted as a result of the downturn in the economy. As vacancy rates increased and absorption decreased, Bentall decided to cap Bentall Five at the 20th story and complete the remainder of building (Phase II) when the market was stronger.

In addition to market conditions, consideration of views was a key driver in the determination to phase vertically the building. Views in Vancouver can command a significant premium in rent, sometimes as much \$10 to \$20 CAN per square foot per year. Bentall investigated constructing two twin towers; however, they felt that twin towers would reduce the views and thus prevent them from capitalizing on the view rental premiums. As such, Bentall elected to phase vertically rather than build two buildings on the site.

By 2005 positive absorption, declining vacancy rates and increasing rental rates were occurring again in downtown Vancouver. In addition job growth and the anticipated growth due to

infrastructure development and the hosting of the 2010 Winter Olympics contributed to Bentall's decision to exercise the option and start construction of Phase II.

Zoning and Permitting Conditions

The zoning process of Bentall Five was relatively simple. The building was approved with the flexibility to be built in one or two phases. The site had enough FAR to allow for the maximum height of Bentall Five. Bentall has a strong and respected position within the Vancouver community and as such the city and local community are highly supportive of Bentall's developments. Bentall believes that their significant reputation enabled them to have a streamlined and rather speedy entitlement process.

The building was designed to building codes that were in place in 2001. The seismic capacity of Bentall Five is designed in accordance with the 2001 municipal codes of Vancouver.

Market Conditions

Market conditions were the dominant factor in Bentall's decision to phase vertically Bentall Five. Bentall Capital viewed the option to phase vertically as a defensive measure against market risk and market volatility. Prior to the construction of Phase I, Vancouver had relatively strong absorption and low vacancy rates. However, due to the events of September 11, 2001, combined with the effect of the burst of the technology bubble, the Vancouver market deteriorated significantly, and vacancy rose and absorption declined. As such, Bentall Capital decided to exercise the option to build Bentall Five in stages. In determining when to exercise the option, Bentall Capital waited until absorption increased, vacancy declined and rental rates increased. Aiding in the return of the stronger office market was Vancouver's designation of hosting the 2010 Winter Olympics, which spurred a lot of infrastructure and other development in the city.

In addition, in the mid-2000s, there was a strong demand for residential or mixed-use building in Vancouver. As a result, a number of commercial buildings were converted to residential, thus reducing the supply of office space. In 2004, it was estimated that 970,000 square feet of office space was being converted to residential, according to the Vancouver City Hall and Bentall Capital.

Bentall Capital constantly evaluated the market conditions and elected to exercise the option for construction of Phase II when they felt the market was strongest. By 2005, the size of the office market had been reduced due to the significant conversion of office space to residential and the improved economic conditions in Vancouver. Bentall Capital felt the market conditions were right to introduce more commercial product to the market. Another one of Bentall's concerns was to not deplete demand for their other office buildings in downtown Vancouver. Bentall Capital controls over two million square feet of office space in downtown Vancouver and was highly sensitive to introducing Bentall Five in a market where it would only attract new tenants and not compete with their other buildings.

Vertical Phasing Conditions

Design

Musson Cattell Mackey Partnership designed Bentall Five so that it could be constructed in one or two phases. The demarcation between Phase I and Phase II occurred at the 20th story (floor 21) as that is where the low-rise elevator bank ended. As discussed earlier, Phase I was comprised of floors 1 to 21 (there is no 13th floor in Bentall Five) and Phase II was floors 22 to 34.

Bentall Capital was specifically concerned about the curtain wall, elevator and structural system in designing Bentall Five. With respect to the curtain wall, they selected a curtain wall that utilized glass that was easily replicable and that could be installed by a number of fabricators. In fact, they had to utilize different glass producers between Phase I and Phase II, as the producer of Phase I went out of business prior to the construction of Phase II. Bentall had to purchase the codes for the original glass and find another producer. This caused a particularly stressful situation for the developer, as the City of Vancouver would only accept glass that matched the existing glass exactly, and the glass manufacturer would not provide advance samples. In the end, the glass ordered matched the original, and the expansion proceeded as planned.

In terms of the elevator design, Bentall Five has six passenger elevators for the low-rise (Phase I) and five passenger elevators for the high-rise (Phase II). There are two additional passenger

elevators that provide service to the underground parking garage. In addition, there is one freight elevator that services the entire building. The elevators are located within the core of the building. The shafts for the five high-rise elevators were incorporated in the design and construction of Phase I. While this strategy increased the up-front cost of providing for elevators, it made the logistics of elevator installation during Phase II easier. To save some up-front costs, the development team decided to not hang rails within the shafts, a decision they later regretted because of the amount of noise it caused during the installation. The elevator banks meant to serve the higher floors were separated from the others by concrete, and this wall was removed during the expansion to create one large elevator bank at the lobby level.

With respect to the structural system, Bentall Five utilized a reinforced concrete structure with a post-tensioned concrete floor system and an aluminum framed dual glazed curtain wall. This enabled for easy construction of Phase I and Phase II.

Construction

The primary challenge in constructing Bentall Five concerned the issues associated with the fact that the lower levels (Phase I) were occupied during the construction of Phase II and that construction of Phase II could not hinder the operations and safety of the occupants of the lower floors. Bentall Capital was fully occupied during the construction of Phase II.

Bentall Capital took a number of measures to ensure that the existing tenants were kept safe and free from disturbance without hindering the progress of the construction of Bentall Five. Bentall Capital's construction plan focused on noise reduction, access to building, overhead protection and tenant communication in order to mitigate disturbance to the existing tenants

In addition, Bentall Capital developed their construction plan prior to leasing Phase I. As such, each of the tenant leases in Phase I included a clause stating that Phase II could occur and that disturbance from the construction of Phase II would not nullify their lease. The lease clause disclosed the probability of Phase II construction and set out certain parameters, including construction related details, overhead protection and staging of Phase II. It is interesting to note that the construction of Phase II occurred prior to any leasing rolling over in Phase I. Bentall

Capital reported that they did not have to provide any concessions to the tenants of Phase I during the construction of Phase II.

The construction schedule of Phase II required a total of 27 months to complete. Work on-site commenced four months after notice to proceed and tenant improvements started eighteen months into the project schedule.

The following is a description for how Bentall Capital mitigated disturbances to the tenants of Phase I during the construction of Phase II. As stated previously, Bentall's efforts focused on noise reduction, access to building, overhead protection and tenant communication.

Noise Reduction

To ensure that the noise levels were kept to a minimum, Bentall generated a list of noise-making activities prior to bidding out the construction work for Phase II. The contractors had to develop their bid and schedule their work according to Bentall's requirements. In addition, Bentall installed noise sensors on the work site that would indicate to workers when they were generating noise that was above the acceptable level. Bentall had the right to stop work should noise levels exceed the allowable thresholds. While Bentall did not have to exact their authority, they believe that their detailed noise reduction plan enabled them to have a better relationship with the tenants of Phase I and also contributed to the fact that they did not have to give concessions to any tenants of Phase I as a result of the construction of Phase II.

Access to Building

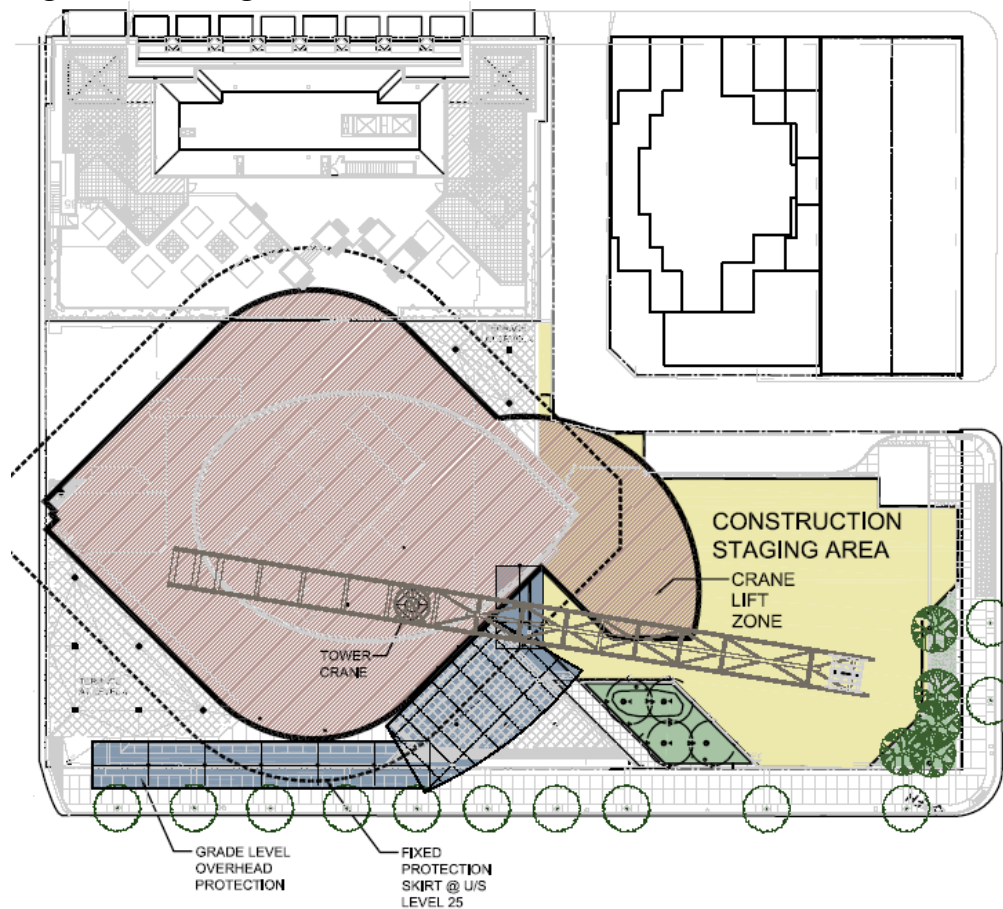
Bentall felt it prudent to maintain tenants' access through the main building entry. When they were "flying" a heavy piece of equipment in front of the main entrance, they temporarily closed or "taped off" the area with supervision and provided an alternate entry through the North end of the building along Burrard Street.

Overhead Protection

As the lower levels of the building were fully occupied during the construction of Phase II, Bentall Capital took extra precaution in developing their overhead protection plan and paid increased attention to the execution of safety plans and structures that protected the occupants of

the lower levels without disrupting their operations. As illustrated in **Figure A.8**, the overhead protection plan consisted of a two elements: an at grade pedestrian safety canopy and a fixed protection skirt or safety apron located at the base of the vertical expansion phase. In addition Bentall Capital had a zero tolerance policy for debris falling from the construction site.

Figure A.8: Diagram of Construction Area



Source: Bentall Capital

The pedestrian safety canopy, or grade level overhead protection, is an elaborate scaffolding system that appears more like an awning than construction scaffolding. Bentall Capital reported investing above what is standard in the pedestrian walkway canopy to minimize the appearance of being at a construction site. In addition, Bentall Capital installed a fixed protection skirt comprised of steel and wood that extended around the perimeter of the building at the base of Phase II. Included in the safety apron was a mesh netting to catch falling debris that extended some 25 feet from the building. The netting moved up the building as construction progressed.

Tenant Communication

Bentall Capital had extensive communication with the tenants during the construction of Phase II. The tenants were notified in advance and during construction of all critical events that could potentially impact their operations. In addition, periodic notices were sent to the tenants to update them as to progress and timing. Bentall believed that by keeping the tenants properly informed of what was taking place on site, they were able to minimize any negative impacts that the tenants could have experienced.

Project Team

Bentall Capital enlisted a similar team for Bentall Five as it had used for the rest of the Bentall Center. For Bentall Five, Bentall Capital was the owner and developer, and Musson Cattell Mackey Partnership was the architect. Interestingly, Bentall Capital used a different construction manager for Phase I and Phase II. In addition, the internal project team from Bentall Capital was different between Phase I and Phase II. Bentall Capital reported that the change in project team make-up between Phase I and Phase II did not hinder the project in any manner, and that no additional insurance was taken out as a direct result of the change in project team.

Financing

Bentall Capital privately financed the development of Bentall Five and did not use any debt in the financing of the project. Furthermore Bentall Capital did not use real options analysis to determine the optimal size of Phase I and Phase II, the optimal timing to exercise the option to build Phase II, or in the valuation of Phase I.

Bentall Capital reported that the cost of the option was rather nominal, possibly in the \$5 million CAD range. The premium was mostly the result of the additional steel required to support Phase II and the construction of the Phase II elevator shafts. According to Bentall Capital, cost drivers associated with construction of Phase II included the mobilization costs associated with elevating labor and materials, the overtime utilized to conduct noise making activities during off-peak hours, the elaborate overhead protection system, a slower construction schedule, and the need to replace certain mechanical systems such as cooling towers and construct a new roof.

Interview Questions

I. When to phase vertically

- a. What were the Owner's Vision/Requirements for the building
 - i. What was the original vision for the building – (size, use, capacity, etc)?
 - ii. How has that vision changed over time?
- b. Zoning Conditions
 - i. How was the building permitted?
 - ii. Was the vertical phasing included in the original permitting?
 - iii. If not, please describe the permitting process for the additional phases?
- c. Market Condition
 - i. How was the original size of the building determined?
 - ii. How did market conditions influence the decision to phase vertically?
 - iii. If built to full capacity initially, could the surplus space be rented out? If so who would be the ideal tenant? How could this building be a multi-tenant building?

II. How to phase vertically

- a. Design
 - i. What unique elements of the design stem from the vertical phasing?
- b. Construction
 - i. Describe the construction process to allow for the vertical phasing.
- c. Project team
 - i. Did the project team changed between the phases?
 - ii. If so, what were the changes and why were they made?
 - iii. Are there specific liability concerns due to the change in project team composition?
- d. Financing
 - i. How was the building financed?
 - ii. Where outside funds used?
 - iii. How much did the building cost to develop?
 - iv. What was the premium for option?
 - v. Were future construction costs estimated during initial phase?
- e. Valuation – Real Options Analysis vs. DCF
 - i. How was the building valued?
 - ii. Were future construction costs considered in the valuation of the building?
 - iii. Was Real Option Analysis used?
- f. Timeline – When to exercise the option
 - i. Why was the option exercised?
 - ii. If not exercised, are there a predefined set of conditions that need to exist to exercise the option?